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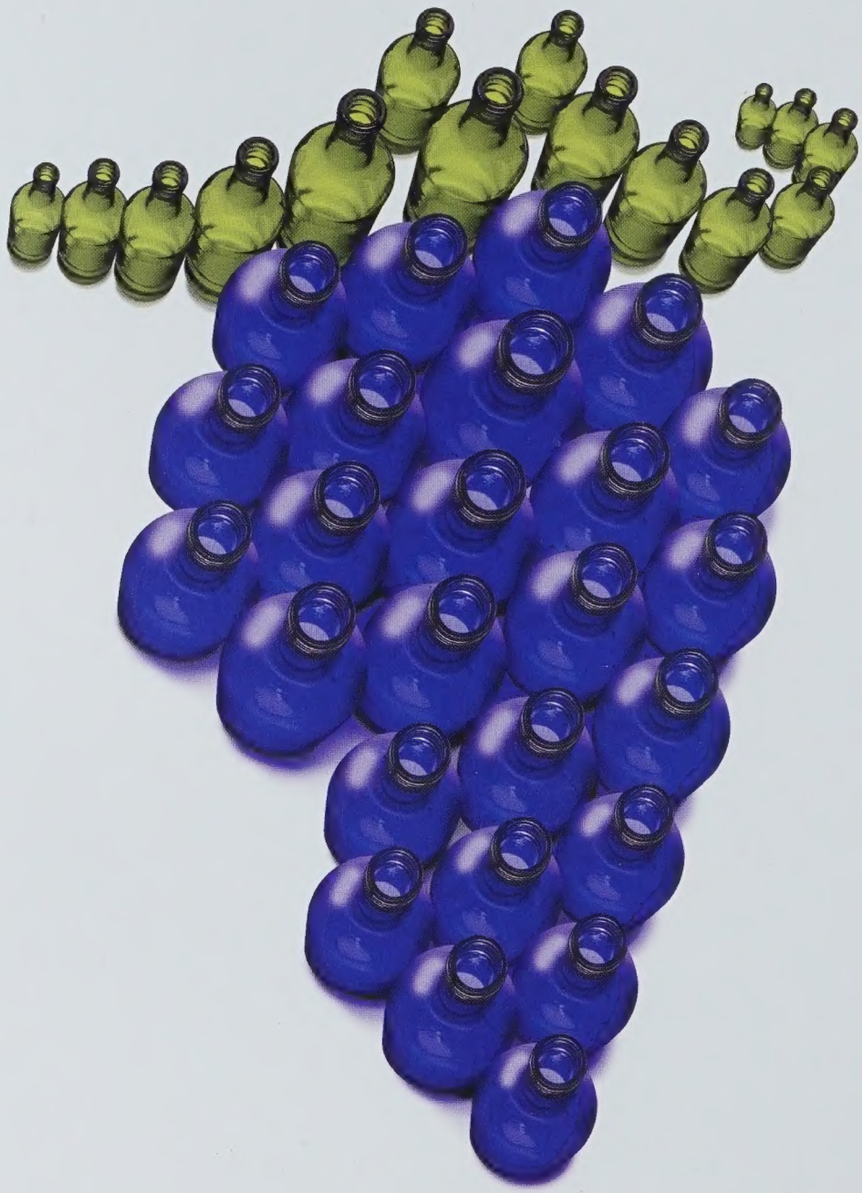

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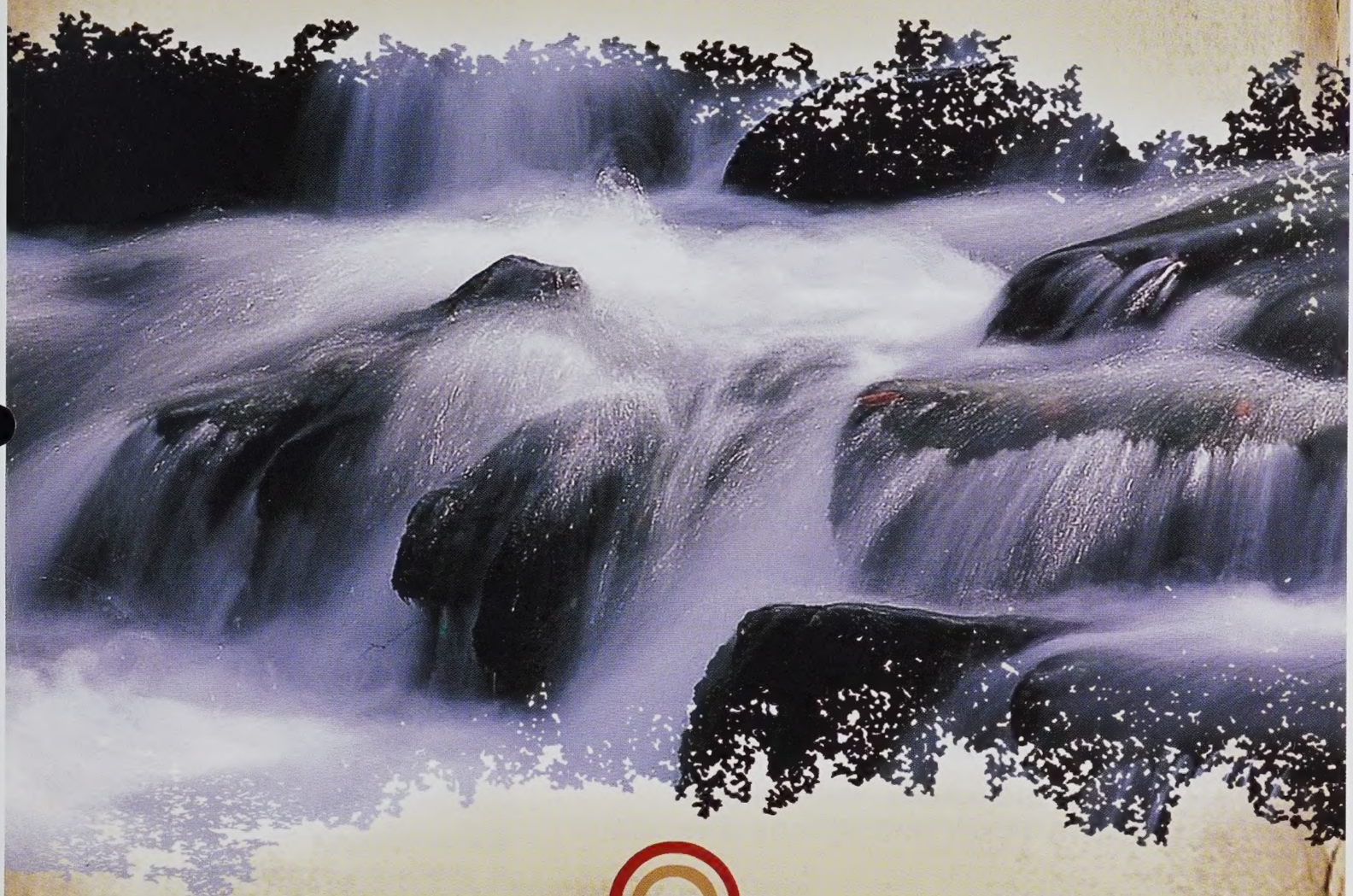

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CONTENTS

6 LangeTwins achieves SavingsByDesign
By Don Neel

SMART VITICULTURE

19 Shoot positioning made easy
By Dr. Richard Smart

25 Improving degree-day calculations
By Mark Battany, Viticulture/Soils Advisor, UCCE, San Luis Obispo, CA

27 Vinification management for aromatic white wines
By Aline Martin and Nichola Hall

42 Protectable trademarks for packaging
By J. Scott Gerien, Dickenson, Peatman & Fogarty, Napa, CA

VARIETAL REVIEW

46 California Rosé by design – Whole cluster pressing, *not* saignée
By Eleanor & Ray Heald

54 Risk control and alternatives – Pre-fermentation maceration in red winemaking
By Charlotte Gourraud and Marie-Laure Murat

66 UC researchers demonstrate potential use of pheromones in management of mealybugs
By Jocelyn Millar, Rebeccah Waterworth, Walt Bentley, Kent Daane, Vaughn Walton, and Monica Cooper

70 Crisis Leadership – What has the global economic crisis wrought?
By Henry Work

72 Brilliant wines – in pursuit of clarity
By Bibiana Guerra, Dept. of Viticulture & Enology, UC Davis

89 Strategies to obtain virus-free vines
By Mike Anderson, Dept. of Viticulture & Enology, UC Davis

92 Applebee's offers Ohio wines "in the neighborhood"
By Don Neel

30 years of service

6 Vaslin-Bucher cross-flow filter at LangeTwins.

78 SHOWCASE
WINEMAKING SUPPLIES

DEPARTMENT

WINE MICROBIOLOGY
94 Spoilage microbe population fluctuations during winemaking – causes, effects, solutions
By Robert Tracy

READER SERVICE

76 Calendar

83 Bookshelf

98 Advertiser Index

Cover photo: Press pad/tank farm with solar panels at LangeTwins Wine Estate (Acampo, CA). Photo by Don Neel.

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One of six juice/wine transfer pumps (L) with premium-efficiency motors save the LangeTwins facility 444 kWh per year. Efficient 350-watt pulse-start lighting mounted under catwalks illuminates 12-foot wide aisle between tanks.

ENERGY EFFICIENCY SERIES #2

BY Don Neel

LANGETWINS ACHIEVES SAVINGS BY DESIGN

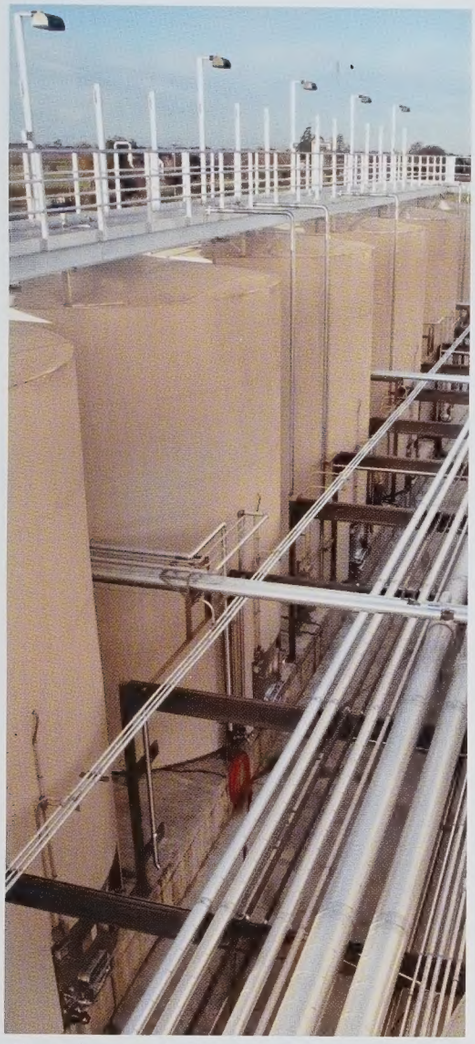
When building an entirely new facility, a winery has the ultimate opportunity to plan well for the long term. Brad and Randy Lange (LangeTwins Wine Estate, Acampo, CA) are fourth-generation winegrowers who own or manage 7,000 acres of vineyards in four counties surrounding Lodi, CA. When they started planning their new winery, they were employing sustainable farming practices such as soil management, biofuels, solar panels powering an efficient irrigation system (see *PWV*, September/October 2007), and multi-row functionality.

Energy efficiency incentives

As the family planned construction of their winery, Randy Lange enrolled them in the Pacific Gas & Electric (PG&E) "Non-Residential New Construction" program, more commonly known as Savings By Design. The utility receives funding from the state's Public Utilities Commission, to pass on as rebates and incentives for energy-efficient building and process design and construction of new commercial, industrial, high-tech, and agricultural facilities.

Engineers Bryan Hackett (BASE Energy, San Francisco, CA) and Larry Waits (PG&E Senior Project Manager), advised the Langes during their planning, and Phil Pennino (local PG&E representative) saw the project to completion and continues to advise the Langes.

"Savings By Design supports high-performance building design and construction, and is also available for major renovations and remodels," Pennino reports. "Customers need to contact us early in the project design for best results. We provide assistance during the building design phase, and up to $500,000 in rebates per project."



48 outdoor tanks have sandstone-colored PolarClad insulation to match the winery building.

The website to obtain details on how to participate in Savings By Design is http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/.

LangeTwins building and equipment

The winery's current capacity is 19,000 tons, and they have permits to expand the 36-acre site up to 44,000 tons. Production has been increasing as the facility has expanded, from 8,000 tons in 2006, to 13,000 tons in 2007, and 15,000 tons in 2008.

The Langes installed the following items for Savings By Design incentives:
1. High-efficiency lighting and lighting occupancy sensors;
2. Premium efficiency motors;
3. Variable frequency drive air compressor;

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4. Insulation on 57 storage and fermentation tanks;
5. High-efficiency water cooled chiller;
6. High-efficiency hot water boiler;

From the "Self-Generation" incentive program, solar panels were installed to offset winery operations energy use.

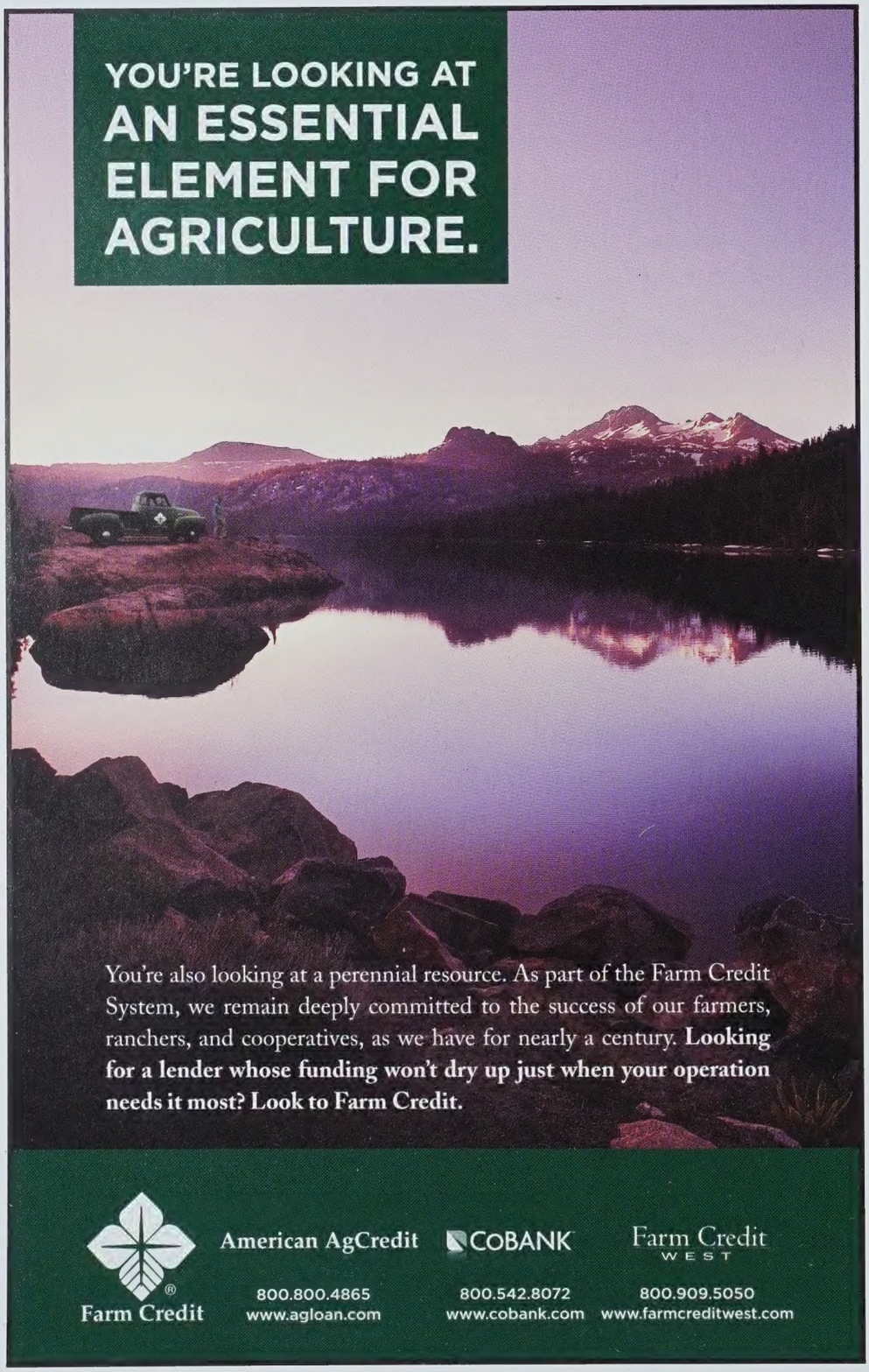
Lighting

In the barrel room, the Langes installed a "split system" — three-tube light fixtures controlled by two switches. One switch turns on a single tube; the second switch turns on two tubes; and use of both switches turns on all three tubes, so that personnel can choose enough light for a given task.

In the barrel room, LangeTwins has T-5 lighting on a "split system" – three-tube light fixtures in which one, two, or all three tubes can be lit as needed.

The use of 350-watt pulse-start lighting under catwalks, and T-5 high-bay lighting with occupancy sensors in the ceiling, exceeded Title 24 requirements for efficiency, saving the winery 28,425 kWh/year over standard lighting systems, and earning a $1,421 incentive.

For more information about lighting fixtures, lamps, and rebates, see "Energy efficiency series #1: Winery lighting upgrades," ***PWV***, March/April 2009.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Wine tank insulation

Polarclad™ tank cladding (a three-inch thick sheath of polystyrene foam with an external bonded aluminum skin) was installed on 48 outdoor tanks at LangeTwins, which is calculated to save the winery 738,166 kWh per year in energy use, and which earned a $88,580 rebate from PG&E.

Refrigeration

Tim Ryan of Axiom Engineers (Monterey, CA) describes the refrigeration system, which includes recirculated glycol; an AAON 185-ton evaporative cooled R404a (four-circuited refrigeration unit with eight compressors for capacity control); a Trane 100-ton air-cooled R404a chiller with two stages of capacity control; and a primary/secondary glycol pumping system with variable speed secondary pumping.

"We had the choice of choosing ammonia instead of glycol, which is much more efficient in energy use," Randy Lange reports. "However, ammonia also carries a high price in work environment safety, and we chose to forego the energy costs for workplace and neighborhood safety."

"The Langes chose glycol because it's food grade, provides excellent and constant wine tank temperature control, has the ability to reach cold stabilization temperatures, and allows all wine tanks to be hooked to a common glycol loop," Ryan says. The fact that the winery can expand this system as capacity increases was also a point in its favor.

The AAON 185-ton unit has eight 30hp scroll compressors and four 3hp evaporator fans controlled by variable frequency drives, multiple circuits for reliability, multiple capacity steps for energy savings, and a low BHP (brake horsepower) per ton ratio, was installed in 2007 to increase capacity and redundancy. The Trane 100-ton chiller was selected for its rugged installation and low initial cost per ton.

A primary/secondary pumping system was installed to provide constant flow through the chillers, while allowing a varying flow to the win-

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Glycol jackets on tanks have individual TankNet controllers, with two chiller systems running parallel (one as primary, one as backup), providing a constant, dependable flow of glycol. T-5 high-bay lighting on occupancy sensors contributes to fermentor room energy efficiency.

ery to save energy on glycol circulation.

The refrigeration system provides a constant dependable flow of cold glycol at 42 psig (pound-force per square inch gauge) pressure to the winery year-round. Which refrigeration compressors and pumps are running is transparent to the winery. The winemaker or cellarmaster has a touch screen on the control panel to choose cold stabilization; all other changes occur automatically.

Glycol jackets on wine tanks are controlled by individual TankNet controllers, which can be set either at the tank or from the winemaker's office/ lab. There is little danger of freezing juice with the glycol jackets compared to a system with refrigerant in the jackets. The two refrigeration systems are piped in parallel, and if a failure occurs in one system, the temperature rise in the circulated glycol will automatically start the other system.

During the off-season (non-receiving/fermentation), the AAON system is primary, with its low brake horsepower/ton ratio due to the evaporative cooled condenser, and multiple steps of capacity control. It functions as eight small units hooked together, and by staging these eight steps of capacity control,

Table I: LangeTwins insulated outdoor tanks

Number of tanks	Capacity per tank (gallons)	Total capacity
42/Fermentors and Storage	46,306 (150-ton)	1,944,852
6/ Storage	90,000	540,000
Total insulated capacity: 2,484,852 gal		

Insulation on tanks saves 738,166 kWh/year compared to un-insulated tanks ($88,580 energy savings).

the unit is never oversized or cycling to maintain the lower off-season glycol loads. The Trane unit is always on-line and will cycle on if glycol temperatures rise, either due to unanticipated loads or failure of the lead AAON system.

During grape receiving/pressing/fermentation, the air-cooled Trane unit is the lead system. The loads that occur during crush are large enough to keep the Trane unit running at 50% or 100% loaded, without cycling the unit. The AAON unit will cycle on with its eight steps of capacity control to trim the load, if the load exceeds the capacity of the Trane unit. Placing the Trane unit as lead system during grape receiving allows it to operate fully loaded at its peak energy-conserving capacity.

Installation of the AAON chiller and system to run as described are calculated to save the winery an estimated 131,850 kWh per year, or $15,822 at current utility rates. PG&E paid a $10,548 incentive on the system.

Compressed air system

Each compressor is served by its own 300-gallon air receiver as an initial connection to the system for final air filtration and maintenance.

A 5,000-gallon receiving tank provides a source of stored air to handle the instantaneous air demand for the Bucher bladder presses. Without this receiver, larger air compressors would have been required to handle the press air demand. This receiver allows for the smaller air compressors to catch up with the air demand between press cycles, without the electrical penalty of running and starting larger compressors.

A 100 hp variable speed drive Atlas Copco air compressor (#1) is the base air supply. It has a built-in compressed air dryer and variable speed drive, to vary its speed and energy consumption to match the winery's compressed air demand.

A 100 hp fixed speed Atlas Copco is the back-up compressor (#2) to provide redundancy in case of the first compressor's failure. Since press operations would halt without an air compressor, redundancy is required. Compressor #2 starts automatically whenever #1 cannot maintain air pressure.

If the air pressure rises above a level that #1 can handle, compressor #1's controller becomes a master controller for both compressors and picks the most energy-efficient mode for the two compressors to run together. Usually compressor #2 will become the base machine at this time, and compressor #1 will vary its speed to trim the load and maintain winery air pressure. This is known as a master-slave arrangement.

The master-slave arrangement of the controls for the air compressors

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Table II: Premium Efficiency Motors at LangeTwins

Equipment	# motors	Horsepower	Standard efficiency*	Premium efficiency	Hours/ year of use	Energy savings (kWh/year)	Demand reduction (kW)
Bucher 320 Press	2	20	0.904	0.930	1,050	727	0.35
65' Screw Conveyor	1	36.2†	0.925	0.930	1,050	82	0.04
Juice Transfer Pumps	6	10	0.893	0.895	876	74	0.01
Hot Water Circ. Pump	1	0.75	0.700	0.755	8,760	383	0.04
Boiler PHW Circ. Pump	1	1.5	0.819	0.875	2,190	144	0.02
Glycol Pumps	2	20	0.904	0.930	4,380	2,021	0.23
Evaporator Fans	4	1	0.784	0.857	2,190	533	0.06
Roof Exhaust Fans	3	3	0.860	0.870	876	59	0.01
Totals	20					4,021	0.75

* Baseline or standard efficiency numbers established by the 1992 Energy Policy Act (EPAct, for motors up to 200 hp) and National Electrical Manufacturers Association (motors up to 500 hp).

† This a 27 kW electric motor

automatically picks the most efficient operating combination of the compressors to meet the compressed air requirement. Estimated energy savings to the winery for the variable speed master compressor (#1) is 149,808 kWh per year, earning a $9,250 incentive from PG&E.

Process water usage

To conserve water, a simple measure the winery undertakes is to use push-brooms to remove solids before washing. High-pressure nozzles speed the washing, and hot water is recirculated in insulated water pipes throughout the winery.

LangeTwins uses a Lechler M20 high-impact tank cleaning system, cap-

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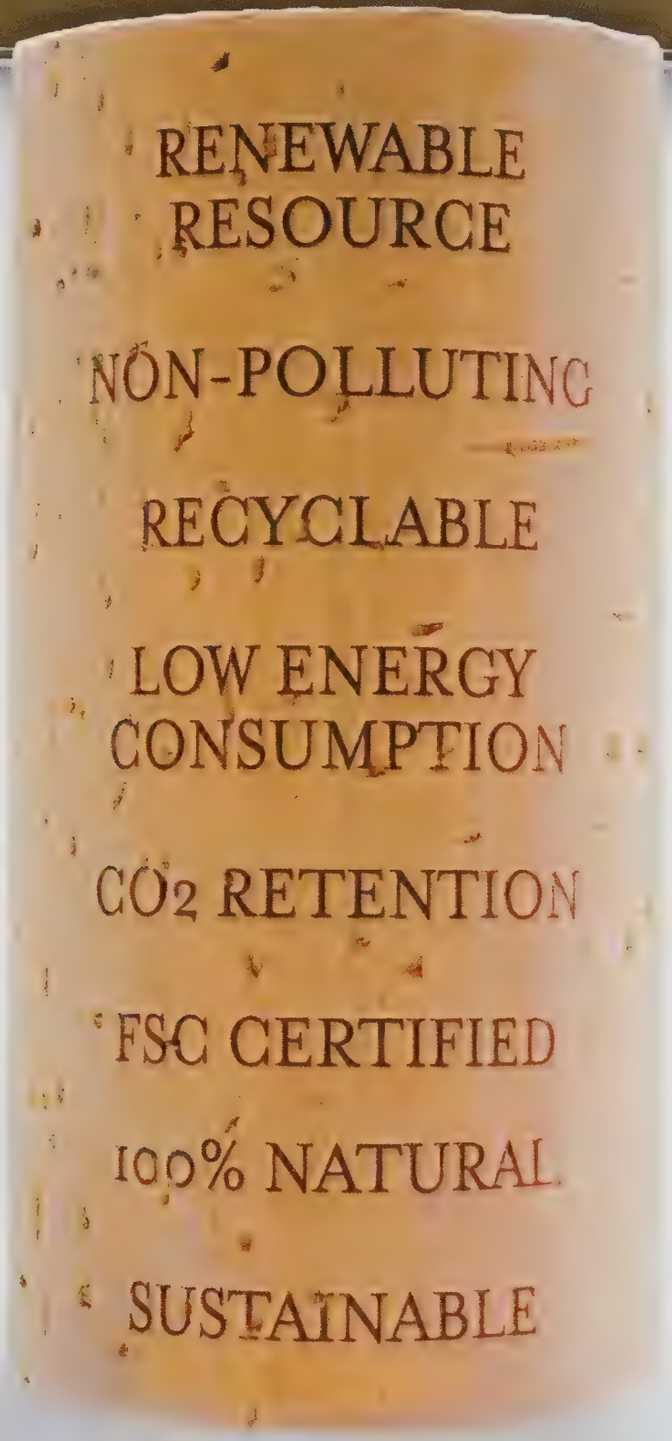

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turing wash water in a 100-gallon "WashDog" mobile container with a dedicated pump to clean additional tanks.

A 50 hp variable-speed submersible pump handles all of the winery water needs, and was designed and installed by Lodi Irrigation to meet variable water demands. The pump can slow down and speed up to provide anywhere from 50 gallons per minute (gpm) to 500 gpm.

If the winery water load goes below 50 gpm, the pump will cycle on and off to maintain water pressure, with the bladder tanks providing the flow during the off cycles, like a standard water pressure system. The water system at the winery is always pressurized. It will speed up the pump to maintain constant pressure between 65 and 80 psi for any flow from near zero to 500 gpm.

A forced-draft, gas-fired Bryan hot water boiler was installed to produce on-demand hot water for sanitation and bottling. Since an on-demand boiler is not constantly heating a loaded tank, the estimated annual natural gas savings is 1,952 therms, or $1,757 per year. LangeTwins earned a $1,562 incentive for installation of the boiler.

Premium efficiency motors

Bryan Hackett (BASE Energy) performed an energy audit on all other motors installed at LangeTwins, from screw and belt conveyors to exhaust fans and pumps. Each motor determined to be "premium-efficiency," as compared to baseline standards, was granted a rebate (see Table II). Hackett estimates the more efficient motors will save the winery an average $992 per year, and PG&E paid an incentive of $662 to the winery for their installation.

Hackett reports that wineries can take advantage of a free "Motor Master" software program, downloadable from the Department of Energy, which identifies premium efficiency motors for equipment presently using standard efficiency motors. The software can be found at www.oit.doe.gov/bestpractices.

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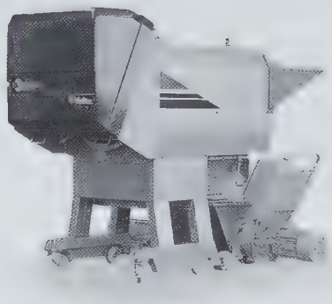

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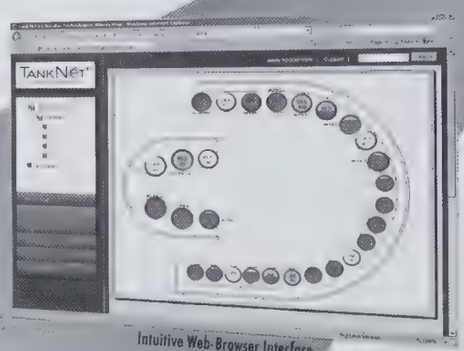

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Table III: Summary of energy-efficiency measures and rebates at LangeTwins

Energy-efficiency measure	Energy savings (kWh/year)	Demand reduction (kW)	Energy cost savings (per year)	Incentive	Payback period (years)
High-efficiency lighting	22,163	9.81	$2,660	$1,108	0.10
Lighting occupancy sensors	203	0.09	$24	$10	2.5
Premium efficiency motors	4,021	0.75	$483	$322	17.6
VFD air compressor	149,808	17.10	$17,977	$11,985	0.5
Tank insulation	738,166	416.10	$88,580	$103,343	2.3
High efficiency chiller	165,914	43.70	$19,910	$23,228	1.8
High efficiency hot water boiler	1,952 (therms/year)	NA	$1,757	$1,562	1.8
TOTALS:	**1,080,275 kWh and 1,952 therms**	**487.6**	**$131,391**	**$141,558**	**1.8**

LangeTwins bought two Bucher 320 presses, and the motor has 3% greater than standard efficiency, earned a rebate and will save the winery an estimated 727 kWh/year.

"Bucher Vaslin uses motors that meet the CEE (Consortium for Energy Efficiency) standards for premium efficiency motors," reports Mike Haswell, general manager of KLR Machines (Sebastopol, CA). "These motors are more expensive in initial cost (usually 10% to 15%), but will pay for themselves over the life of the motor. Premium efficiency motors are typically from 2% to 5% more efficient than standard motors."

NOTE: Bucher Vaslin has introduced a PLC in 2009 for six XPlus presses (22 hl to 80 hl capacity) that complies with the new European standards calling for electronic components that are more environmentally friendly (known as RoHS). Compliant components contain less lead, mercury, cadmium, polybrominated biphenyl (PBB), and polybrominated diphenyl ether (PBDE) flame retardants.

Solar PV system

Installed as a canopy above the press pad in late 2008 by Renewable

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Technologies Inc. (Sutter Creek, CA), the newest solar array at LangeTwins has 136 panels totaling 25.29 kW. The canopy installation provides sun shade plus power generation.

"The interesting thing about the array over the presses is the panels are bi-facial," Randy Lange explains. "This means they allow ambient sunlight through, which provides a bounce-back to the underside of the panels, producing even more electricity."

The total solar investment at LangeTwins is now four complete arrays; two power vineyard irrigation pumps (10 kW and 20 kW); one powering the mechanical shop and offices (65 kW); and the fourth on the winery rooftop and above the press pad (230 kW). The 230 kW winery system cost a total of $1.9 million, and PG&E provided $651,426 in rebates. Randy Lange and PG&E engineers believe this will provide about 50% of the power needed for the winery's current operations.

New solar array as a canopy above presses.

Conclusion

Preparing for the future as they build to meet present needs, the Lange generational family business continues to realize energy savings from the equipment they've installed, and to generate a great deal of their own power. When they expand the winery in the future, the payback from these installations will help finance the future — long-term planning paying off. ■

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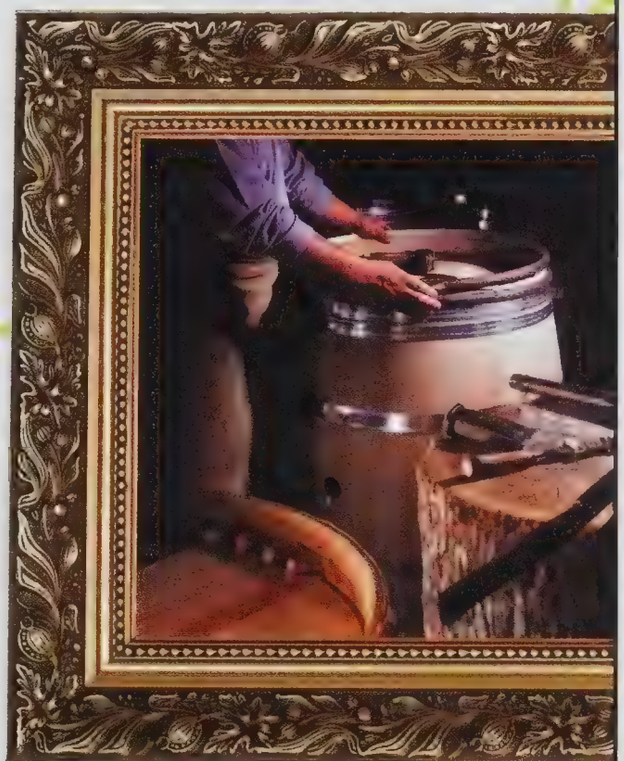

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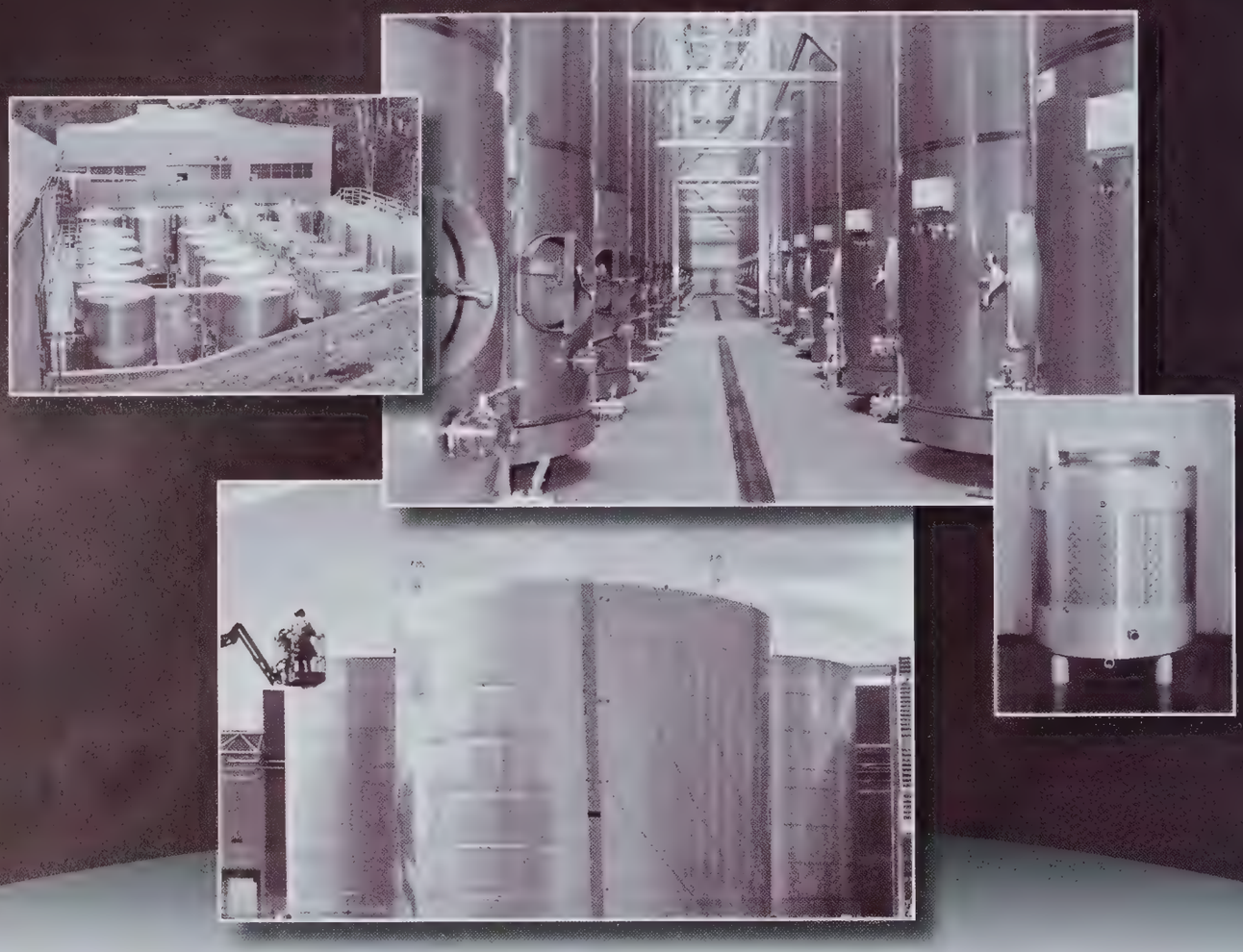

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Shoot positioning made easy

BY Dr. Richard Smart

Shoot positioning has become a common operation in many American vineyards, especially over the last 20 or so years in cool to warm climate vineyards. In hotter regions, such as California's Central Valley, shoot positioning is not typically used, as the canopies are allowed to "sprawl."

The aim of shoot positioning is to control the leaf and fruit exposure and also to facilitate other operations, such as leaf removal, crop thinning, tip trimming, mechanical harvesting, and pruning. You can see that having shoots in a prescribed position makes many other vineyard operations easier.

Shoot positioning skills

As with other skills we practice in vineyards, shoot positioning is not always done in a timely or cost-effective manner. This is particularly true for vertically divided trellis systems, such as Scott Henry and Smart Dyson. Such systems are recommended for moderate to high vigor vineyards, when the pruning weight exceeds 0.35 pounds per linear foot of vine row.

Figure I. Tendrils can bind to each other, wires, and shoots. This process begins about one week before bloom.

Figure II. Lifting wires up to free them, prior to pulling out and down, and then brushing shoots into position.

In fact, many people are put off the use of vertically divided systems like Scott Henry, claiming that "shoot positioning" is too difficult. I am amazed how many people claim to be challenged by managing such systems.

These systems are not difficult to manage, as long as simple rules are followed and vineyard labor is appropriately trained. In my experience, failure to train or supervise workers appropriately are the principal reasons why many vineyard operations are not

Figure IV. First lift of wire on VSP trellis completed, shoots brushed in place behind wire, which is now back in original position.

properly executed, shoot positioning included.

Many vignerons prefer to use the Vertical Shoot Positioned (VSP) trellis because they say "it is simple to use." In my opinion, Scott Henry and Smart Dyson trellis systems are equally as simple to use as VSP. I see many vineyards producing less than their yield and quality potential and suffering increased disease pressure, all because of poor trellis choice and fear of "complexity." Come on, we are not landing a man on the moon here!

In any event, this column will show just how simple shoot positioning can be.

Basic concepts and principles

Any pass through a vineyard to do shoot positioning should take only about four man hours per acre. This value could be a little higher with very close row spacing. If the timing exceeds this figure in your vineyard, then you are doing something wrong. This column will help diagnose common problems.

1) Timing of shoot positioning is critical. If it is done too early in the season, shoots are inclined to break. If it is done too late in the season, tendrils will have bound the shoots together and also to the wires, making operations very difficult. When this happens, shoots must be individually released from tendrils, and they will often break in the process. **The first shoot positioning passes must be done before tendrils begin to attach.**

Tendrils become "thigmotropic," that is touch-sensitive, about two weeks before flowering. Once they become sensitive to touch, they begin curling and attaching. The initial shoot separation must be done in the window of time before tendrils become touch-sensitive, usually two weeks or so before flowering.

2) Workers should not touch individual shoots, but should do all positioning of shoots using movable foliage wires. When people tell me of unnecessarily long times to do shoot positioning, it is

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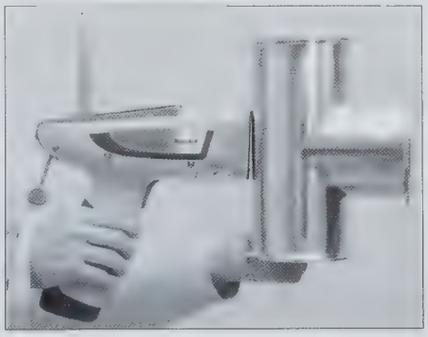

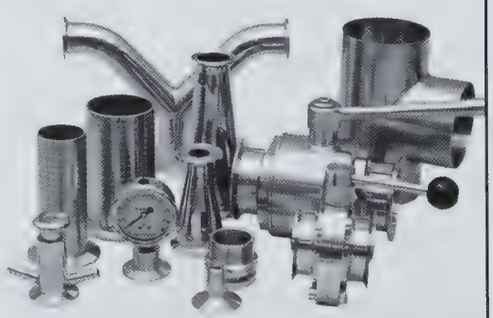

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usually because individual shoots are placed behind wires, rather than moving the wire to position all shoots at once.

3) Have only one person on each side of the vine row. Often, I see several workers spread out along the vine row, and this means that they each do a small amount of work and a lot of walking. This approach is very costly and is poor labor management.

4) Plan the time of day of shoot positioning. You will experience less shoot breakage when the operation is done toward the middle of the day when the shoots are less turgid. Also, allow the canopy to dry out after rain before doing shoot positioning.

5) Foliage wires should be tight and not loose. Loose wires are a major cause of slow shoot positioning operations. Another common problem is the use of metal stakes with angled foliage wire slots. Such a design is undesirable as it requires loose foliage wires and considerable effort by the workers to insert and remove wires from the slots.

The original Smart Post I designed had the slot entrance parallel to the ground, making it easy for the wire to be inserted and removed. Surely in the future, this operation will be mechanized, making easy insertion and removal of foliage wires even more necessary.

6) Leave the foliage wires in the position in which they are used during the summer. This means that there will be two pairs of foliage wires in place above the fruiting wire at all times. The shoot positioning action then is to lift the wires out of their clips, pull outward and downward toward the center of the vine row, and then brush shoots upward with the wire and replace the wire in the clip.

Some people prefer to put the wires on the ground after winter pruning. In my opinion this is unnecessary, and I have sometimes seen two wires entangled with each other as a result of this practice.

Shoot positioning of VSP

Shoot positioning of VSP normally requires two passes. These are achieved

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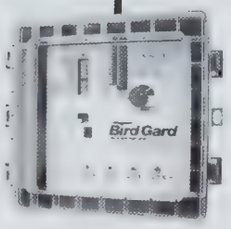

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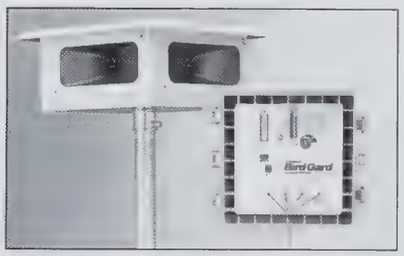

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Figure III. Brushing shoots in place, first lift upward on VSP trellis.

Figure VI. Shoots to be trained downward in Scott Henry trellis are now all in front of the moveable foliage wire. The wire can be rested on the shoots.

with one person on each side of the vine row. Total time required for shoot positioning should be less than four hours per acre per pass to total about eight or so hours per acre.

The first pass occurs a couple of weeks before flowering. At this time

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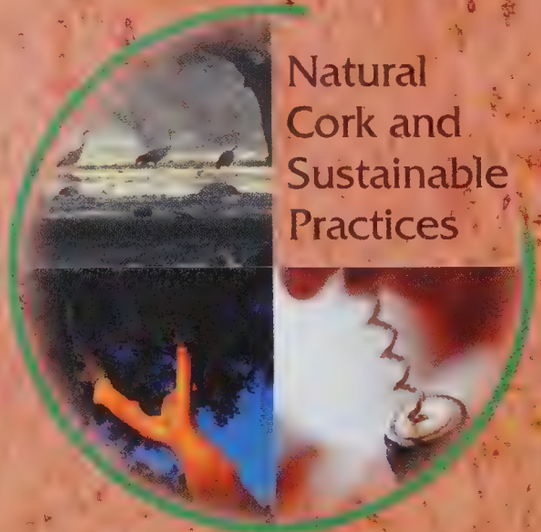

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Figure V. After the first pass for the Scott Henry trellis, all shoots should be positioned downwards outside the downward moveable foliage wire.

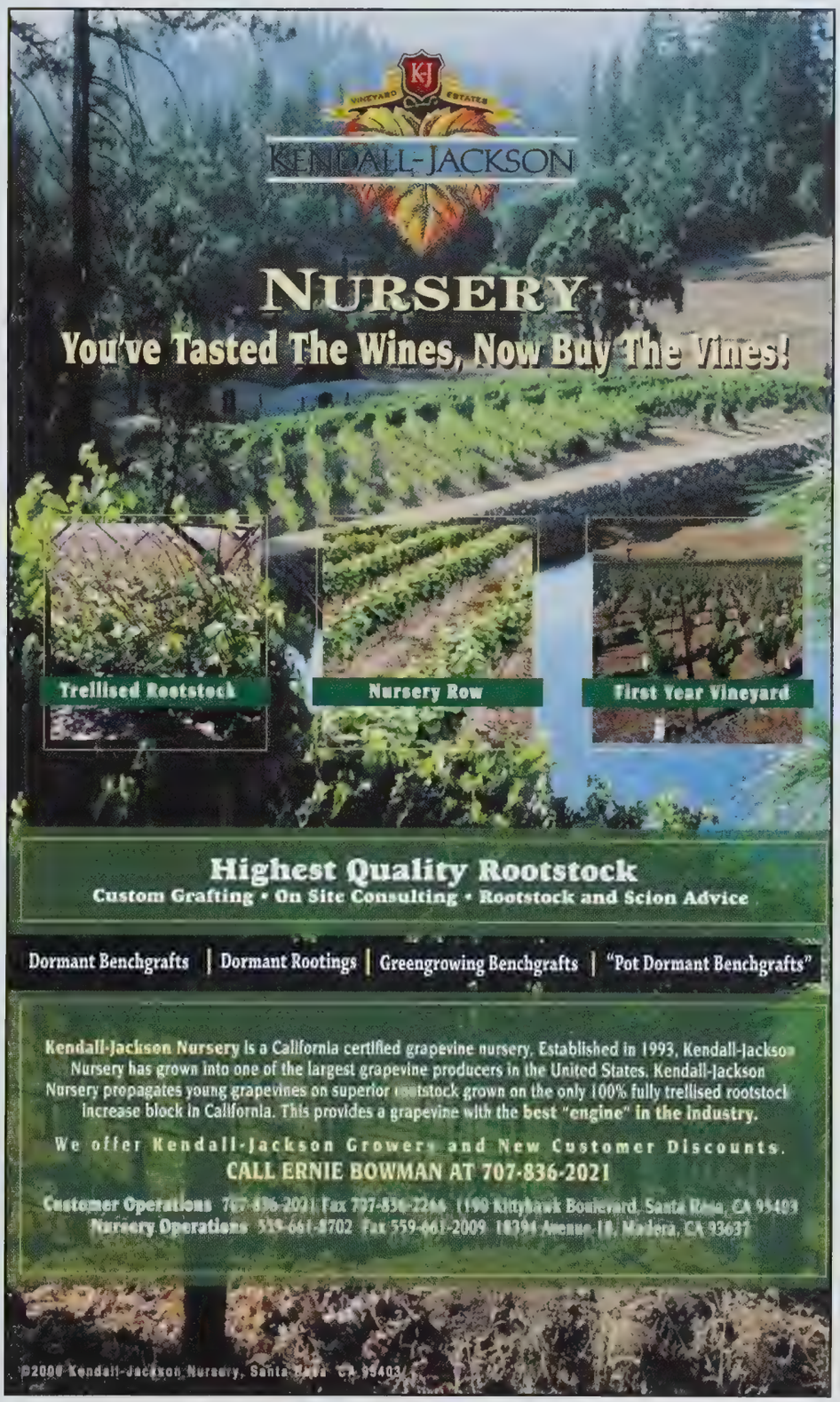
the shoots are normally 12 to 15 inches long. The first action is to lift the wire vertically upward, in case the tendrils have taken hold early, then pull the wire downward and outward, and then bring it back at the base of the shoots. Then brush the shoots upward before replacing the wire in its position. You should not need to touch any individual shoots.

The second pass is normally done a couple of weeks after flowering, when about 90% of the shoot tips have grown past the second foliage wire position. The same action is repeated with the second foliage wire as was used for the first. Lift the wire upward to detach tendrils, then pull the wire out and then in to brush shoots into place.

Figure VII. Sometimes the lower shoots on Scott Henry trellis will fall downward under their own weight, shown here, without tendrils to hold them up. This often occurs before the shoot positioning wire has been moved down and clipped into position.

Shoot positioning of Scott Henry

Vertically divided canopies like Scott Henry require an extra pass. This is normally done when the shoots are 12 to 15 inches long, and it requires only one person per vine row. The operation is carried out at walking speed, and shoots from the lower cane are brushed by hand outside of the movable shoot positioning wire, which at this stage is sitting about six inches above the lower fruiting wire. This wire should be on the same side of the post as the lower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fruiting wire. Sometimes this wire can be removed from its position to sit on the shoots.

As flowering approaches, the first vertical lift of shoots from the upper cane takes place as described above for the VSP. Simultaneously, the shoots to be trained downward can be separated further from the canopy by moving the foliage wire out onto the shoots. These shoots at this time can be seen to be distinctly separated from those growing upward.

The final pass for Scott Henry is the same as for the second pass of the VSP. It positions the shoot tips of the upward growing shoots inside the top foliage wire. At the same time, the movable foliage wire, which controls the downward pointing shoots can be attached in place, normally about 18 inches below the bottom fruiting wire.

The normal time requirement for these three passes is 10 to 15 hours per acre. I normally advise clients that the time requirement for Scott Henry shoot positioning is two to four hours per acre more than VSP.

Conclusion

Follow these steps and you will end up with economical shoot positioning operations. You can always tell if shoot positioning has been carried out properly when you see a canopy after leaf fall. If the shoots are vertical, either up or down, then you know the timing of positioning was good. ■

Dr. Richard Smart, "the flying vinedoctor," is an international viticultural consultant based in Launceston, Tasmania, in Australia. He can be contacted by e-mail: vinedoctor@compuserve.com. Read about Dr. Smart's business, including his consulting schedule, educational wine tours, and seminars, at his home page http://www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/838-6312 and http://www.vinquiry.com.

Improving degree-day calculations

BY **Mark Battany,**
Viticulture/Soils Farm Advisor
University of California Cooperative Extension,
San Luis Obispo, CA

Growing Degree Days (GDD) are the standard units of measure used to quantify the heat summation over a period of time, such as an entire growing season or the developmental period for an insect pest.

However, there is more than one method to calculate the GDD, and various methods will often produce different results from the same data set. Therefore, it is important to use consistent calculation methods when comparing to historical data, or when following a specific model.

Temperature-recording devices

Until fairly recently, the most advanced device for recording temperatures on site was the max-min thermometer. This mechanical device only needed to be read once per day, because it physically recorded the most recent maximum and minimum temperatures; it also **had** to be read each and every day if one wanted to collect daily temperature data.

Due to the widespread use of these devices in the last century, most of the long-term historical temperature data consists of daily max-min values. When early studies of California vineyard climates were conducted by M.A. Amerine and A.J. Winkler in the 1940s, they relied on this type of data, producing their classifications of the climatic Regions I, II, III, IV, and V throughout the state.[1]

The advent of electronic data loggers in recent years has now enabled taking temperature readings at much finer time scales, creating heat summations that more accurately describe the actual local temperature conditions. However, because the GDD numbers will differ based on which summation method is employed, it is important to know the calculation method used if comparing results.

For example, if we compare to the older Amerine and Winkler vineyard climatic region values, you need to calculate GDD following the same method they used.

Calculation methods

In their delineation of climatic regions, Amerine and Winkler used the simple method of averaging the daily max-min data and then subtracting a base temperature value, with the following formula:

GDD (°F) =
[Daily Max (°F) + Daily Min (°F)] / 2 — 50°F

where 50°F (equivalent to 10°C) is the base temperature; below this temperature no growth is considered to occur. All positive daily GDD for the period of interest are then added together, for example from April 1 through October 31 for a growing season. Any negative values are not included in the summation.

More complicated formulas based on the daily max-min values are also employed, which use mathematical methods to better estimate the non-linear behavior of daily temperature fluctuations. For example, the single sine formula assumes that temperature throughout the day follows a pattern similar to a sine wave.

Other formulas may use lower threshold temperature values than 50°F, and may also incorporate an upper threshold temperature, above which the temperature does not add to the GDD sum. These other formulas and their applications are explained in detail on the University of California IPM website.[2]

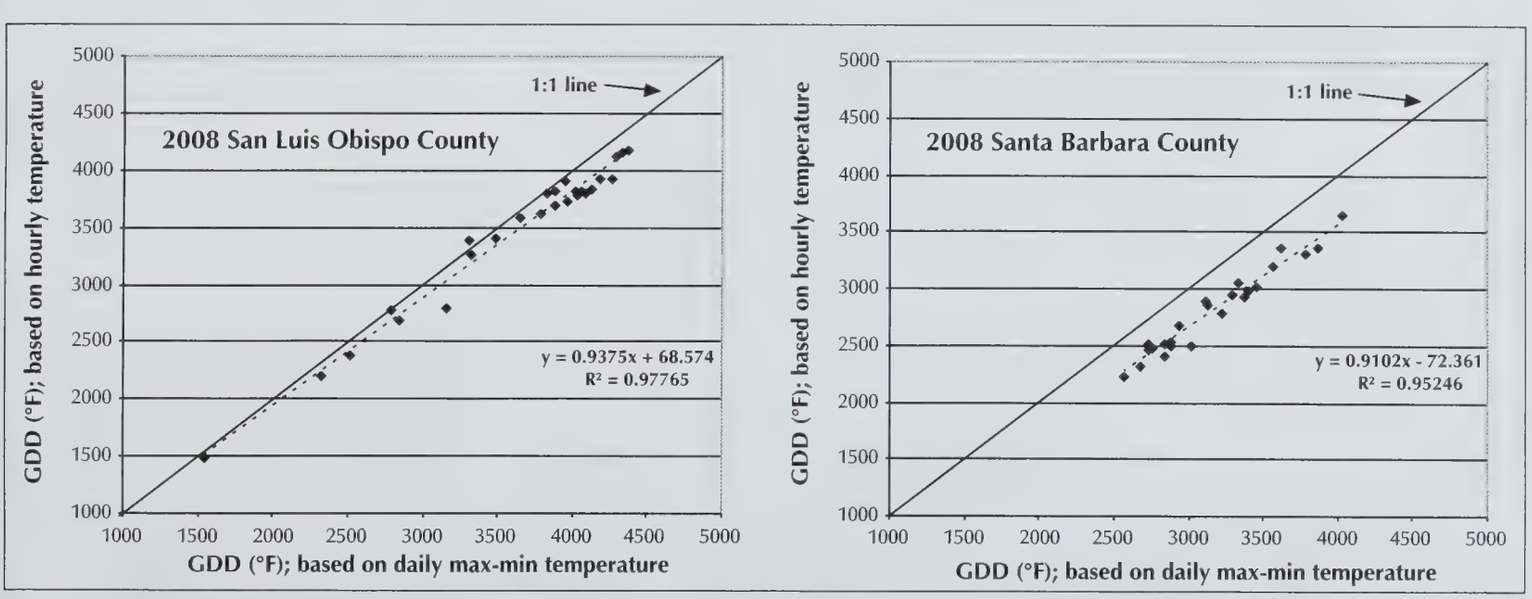
2008 San Luis Obispo County
1:1 line
y = 0.9375x + 68.574
R² = 0.97765
GDD (°F); based on hourly temperature
GDD (°F); based on daily max-min temperature
2008 Santa Barbara County
1:1 line
y = 0.9102x - 72.361
R² = 0.95246
GDD (°F); based on hourly temperature
GDD (°F); based on daily max-min temperature

Figure 1. Growing degree-days (°F) calculated with daily max-min temperature measurements compared to hourly temperature measurements, for San Luis Obispo and Santa Barbara Counties in 2008. Values are for the entire growing season, April 1 to October 31, for each temperature site in the two counties. If the methods produced the same results, the points would fall on the 1:1 line.

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With the wide availability of hourly temperature data, it makes logical sense to incorporate this more detailed information into assessments of temperature summations. However, one needs to bear in mind that the GDD calculated with daily max-min values can often be quite different from that calculated from hourly data, and therefore the two should not be used interchangeably. The formula used to calculate each day's GDD based on hourly values is:

GDD (hourly) = Average value of the 24 hourly readings (°F) – 50°F

The daily values are then added together as in the previous method to produce the total seasonal GDD value. Figure 1 evaluates seasonal GDD calculations based on daily max-min values compared to hourly temperatures for temperature stations throughout Santa Barbara and San Luis Obispo counties in 2008.[3,4] Seasonal GDD calculations using hourly data are notably lower than those based on daily max-min values in the Central Coast area.

The actual degree of difference observed will vary depending on the characteristic temperature patterns of a given area; as such the differences noted in this example may not be the same as will be observed elsewhere.

The GDD concept is a valuable tool for measuring growth-related temperatures. Because modern equipment allows calculations with many more measurements than was possible in the past, one must be careful to use the appropriate calculation method when comparing to historical data or following model predictions. ■

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4. Vineyard air temperature, San Luis Obispo County. UCCE website. http://groups.ucanr.org/SLOtemperature

VINIFICATION MANAGEMENT

Aromatic white wines

BY Aline Martin[1],
Nichola Hall
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Corresponding author:
amartin@sofralab.com

Vinification management is essential in order to enhance an aromatic white wine. The different processes currently available to preserve and express all of the positive aromas found in grapes are reviewed below. There is also discussions encompassing different pre-fermentation operations, yeast selection, temperature, and yeast nutrition management all of which are key elements in achieving desirable white wine attributes.

Pre-fermentation operations

Prior to fermentation, winemakers should consider certain pre-fermentation options which can ultimately enhance the aromatic potential of the grape.

As soon as the juice is released from the berries, it is exposed to air; therefore it is subject to oxidation which can lead to the browning of polyphenolic compounds. At this stage there are several considerations in order to protect the juice from oxidation, traditional remedies such as addition of SO_2 or PVPP-casein blends, or enological tannins and specific inactivated yeasts.

The correct utilization of SO_2, (which exerts antioxidant, antioxidasic, and antimicrobial properties) is essential in order to protect aromas and polyphenols against oxidative browning. SO_2 also exerts anti-microbial activity, which assists in protecting the juice from spoilage and associated aromas.

The use of casein and PVPP in the juice stage can help to eliminate the oxidative aroma and also reduce browning precursors.

Alternatively, winemakers can decide to increase the protection against oxidation by using specific inactivated yeasts or enological tannins. Due to their antioxidant properties, tannin additions result in brighter, more aromatic wines with greater clarity (Figure I).

Aroma extraction

Maceration techniques, such as skin maceration for a few hours or cold maceration for a few days, may optimize the extraction of aromas and aromatic precursors. As a preventative measure, it is necessary to adequately protect the must against oxidation.

Many aroma compounds which are located in the grape skin exist as non-odorous precursors. For example, glycosylated precursors, terpene compounds, norisoprenoid derivatives, methoxypyrazines, and the varietal thiol precursors: 3- mercaptohexan-1-ol (3MH), 4-mercapto-4-methyl-pentan-2-one (4MMP), and 4-mercapto-4-methylpentan-2-ol (4MMPOH) which are found in the grape skin at 50%, 10%, and 20% respectively.[30]

Skin maceration at a temperature of approximately 20°C (68°F) facilitates the release of these precursors.[25] Once the precursors are released into the juice, the aromas may be revealed due to the enzymatic activities of specific yeast strains during alcoholic fermentation.

Clarification

Clarification and racking is an essential step for vinification of aromatic white wines. Racking removes sediment that may contain vegetal or earthy residuals, thus influencing the aroma of the must. More important, racking removes the C16 and C18 unsaturated fatty acids. By removing these unsaturated fatty acids they cannot be transformed during alcoholic fermentation into C6 and C8 alcohols which have an herbaceous odor.[9]

Must clarification also limits production of methionol and other sulfur compounds, which can be released by yeasts during fermentation if the turbidity exceeds 250 NTU.[18,19]

However, a suitably clarified must with low turbidity favors the production (by yeasts) of fatty acid ethyl esters and higher alcohols with positive banana, pear, apple, honey, and pineapple aromas.[32]

Clarification is a delicate step, which can positively influence organoleptic qualities, but it can also have a negative impact on fermentation kinetics (as it removes compounds which are essential for the yeast lipids).[29]

Clarification also removes some of the indigenous flora. Therefore, it is recommended to inoculate with your selected yeast strain after must clarification.

However, the C16 and C18 unsaturated fatty acids, which are unpleasant

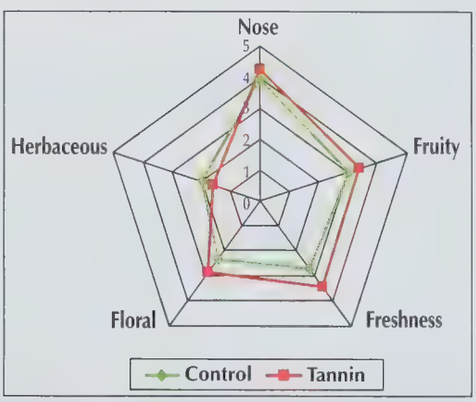


Figure I: Tasting of wine after fermentation. Impact of the addition of skin grape tannin on a Grenache Blanc (Côtes du Rhône) must at 10 g/hL. (Graphic created in partnership with Inter-Rhône.)

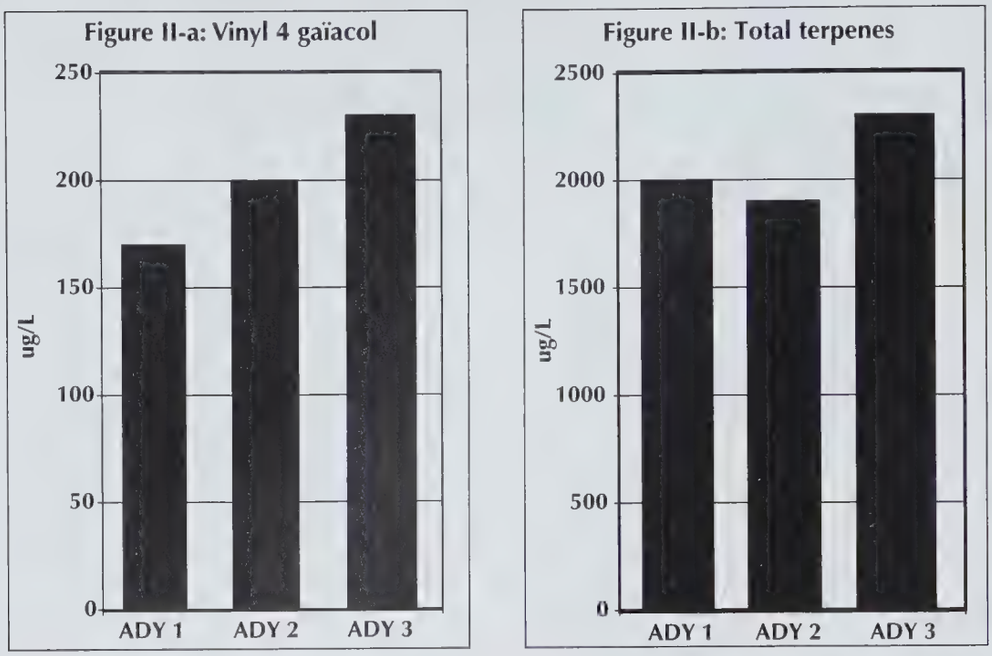


Figure II: Aroma analysis. Impact of the yeast strain on wine aromas, in Gewurztraminer from Alsace.

aroma precursors (herbaceous), are very useful in order to maintain yeast integrity. Unsaturated fatty acids (C16 and C18) are integrated into the yeast membrane improving fluidity and also binding toxic inhibitors which may be produced during alcoholic fermentation.[1,29] Thus, their removal has a negative impact on yeast metabolism, but is positive from a sensory perspective.

It is essential to obtain a positive balance which enhances a wine's organoleptic qualities without causing detriment to yeast fermentation. Overall, the optimum turbidity is considered to be between 150 and 200 NTU. Addition of yeast hulls and adjuvants can complement the must that has been excessively clarified and allow the fermentation to continue under positive conditions.[16,17]

Yeast selection

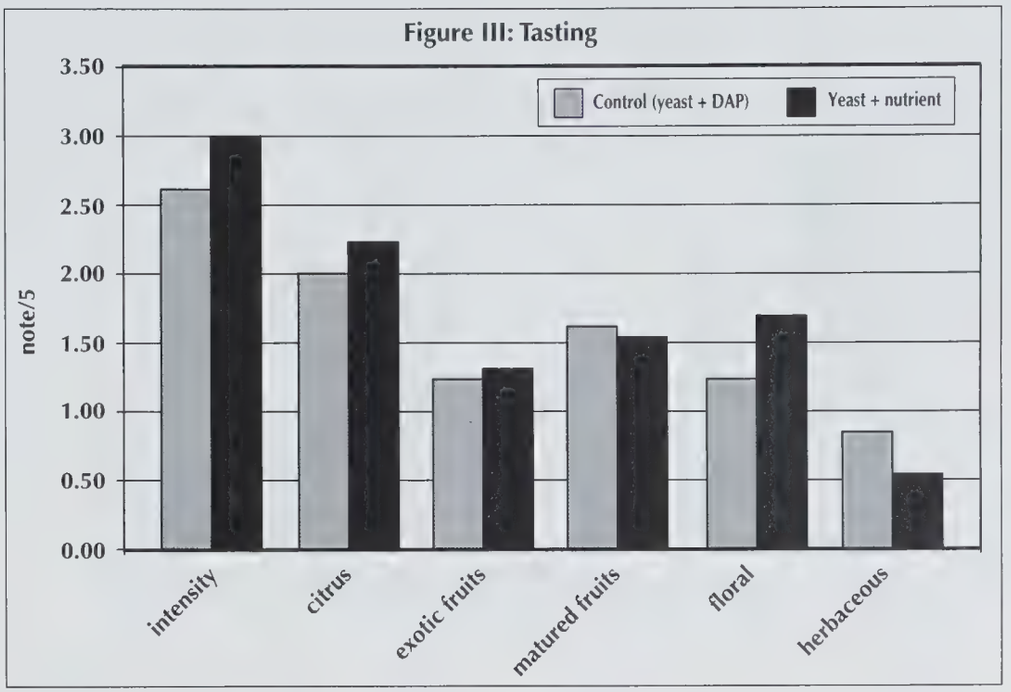
Yeasts are the external factor, which have the most influence on the aroma characteristics of the wine. Studies have shown that the expression and production of aromas highly depend on the yeast strain.[27,36] Thus, careful

yeast selection is of paramount importance in order to enhance the aromatic potential of a white wine.

For example, in a Gewurztraminer fermentation, Active Dry Yeast (ADY) n°3 revealed more spicy aromas and floral and fruity terpene compounds than two other yeasts it was compared to (Figure II).

Yeast strains from the *Saccharomyces cerevisiae* species produce the most desirable (higher) esters.[5,36] It is the main species among the yeasts selected for enological application and commercialized as ADY. *Saccharomyces bayanus* (according to the new taxonomy, a species different from *Saccharomyces cerevisiae galactose*) or the hybrids *S. cerevisiae* x *S. bayanus* are known for their capacity to reveal varietal thiols from their precursors.[21]

Physiological parameters of white vinification can also influence yeast selection. Ideally, a yeast selected for an aromatic white wine has to tolerate



Impact of the addition of complex nutrient at 20 g/hl after yeast addition and at mid-fermentation, compared with addition of phospate diamonic (DAP) at 20 g/hl. Muscadet, Val de Loire.

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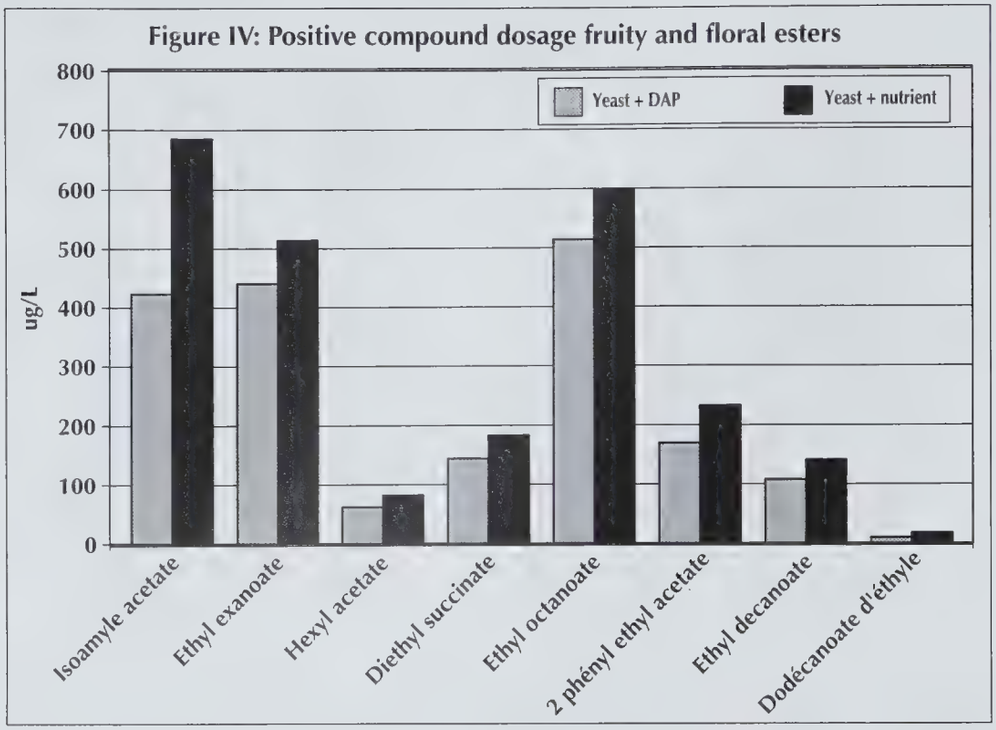

Impact of the addition of complex nutrient at 20 g/hl after yeast addition and at mid-fermentation, compared with addition of phospate diamonic (DAP) at 20 g/hl. Shiraz Rosé.

relatively low fermentation temperatures, withstand the lipid deficiency, and possibly resist a high alcohol level. It is very important that you select a strain that can ferment under specific conditions and can produce desirable, stable aromas.

Fermentation temperature

One key element for a healthy fermentation is temperature. It is recommended that fermentation proceed at a temperature range of 15° to 20°C (59° to 68°F),[5,6] in order to favor the production of fatty acid ethyl esters, acetates, and higher alcohol which contributes to floral and fruity aromas, and to limit production of higher alcohol with neutral or even heavy aromas.[10,23,24,28,31]

With regards to the particular case of volatile thiol production (with Sauvignon Blanc and rosé wines from Bordeaux), a 20°C temperature seems to be more beneficial than a lower temperature of 13°C.[22,26]

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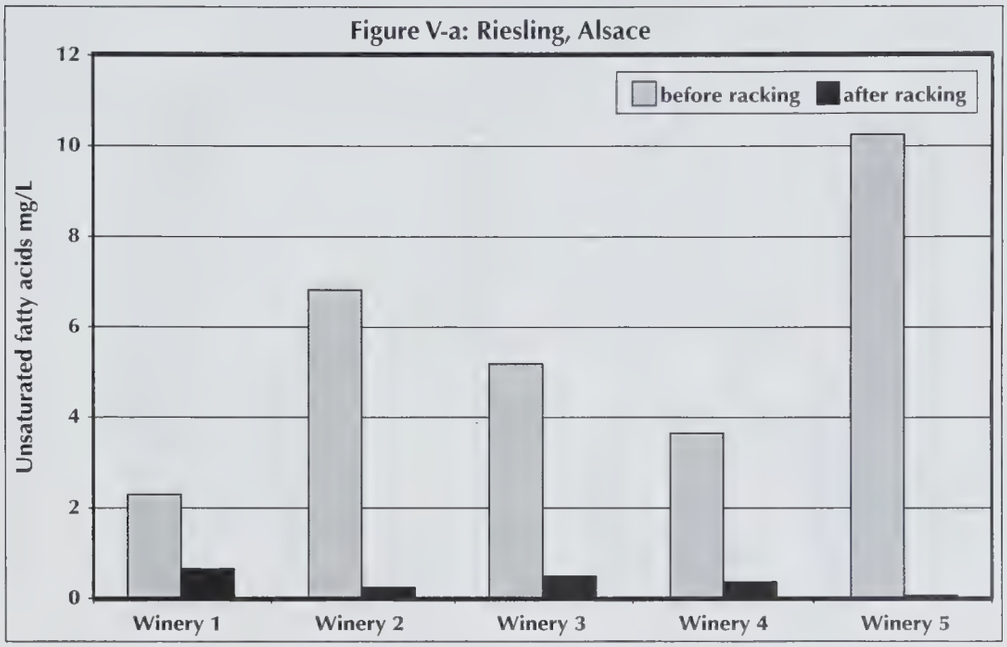
Yeast nutrient management

Due to research carried out over the past several decades, nutrient requirements of yeast have been identified. Individual yeast strains differ in their nutrient requirements and each nutrient has a specific role within the frame of yeast metabolism.

During the lag phase, yeast cells require vitamins, minerals, and nitrogen to fill their enzymatic pool and acclimatize to their environment. Thiamine and nitrogen play an essential role during the growth phase for cell multiplication and the start of alcoholic fermentation. The majority of ethanol is produced during the stationary phase when the sugar transport system needs to continue. This is only possible if there is a sufficient level of nitrogen.

It seems obvious that good yeast nutrient management has an impact on fermentation kinetics. Optimized yeast nutrient management also has a positive impact on the organoleptic qualities of a wine by limiting the development of negative compounds such as H_2S and favoring the production of fruity and floral aromas.



Analysis of fatty acids concentration before and after racking.

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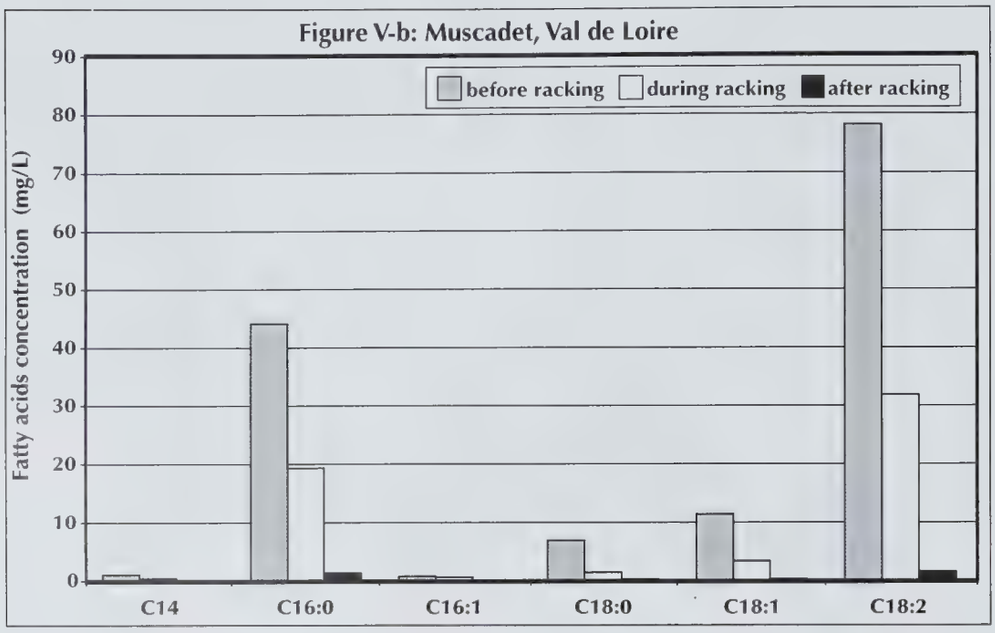

Sum of fatty acids in must at five wineries before, during and after racking.

Vitamins and Minerals

Thiamine is a vitamin, which is necessary for yeast cell multiplication and is found naturally in grapes. It is rapidly consumed by indigenous microorganisms during pre-fermentation operations such as grape transport, skin and pre-fermentation, cold maceration, pressing, and clarification.

It has been clearly shown that thiamine deficiency can strongly inhibit yeast growth. Thus, the viable yeast biomass is clearly inferior,[2] which may lead to sluggish or even stuck fermentations.

Apiculated yeasts (such as *Kloeckera*), which are found in large number in the must, are able to consume all the thiamine within a two to three hour time frame.[2] Therefore, it may be advantageous to add thiamine in order to promote healthy active dry yeast. Without an exogenous thiamine addition, deficiencies can lead to cell growth impairment.

Thiamine requirements increase with the amount of nitrogen found in the must, such as the higher the nitrogen content, the more thiamine that is required in order to limit the possibility of growth inhibition.

Other vitamins can also influence yeast metabolism. Adequate levels of cal-

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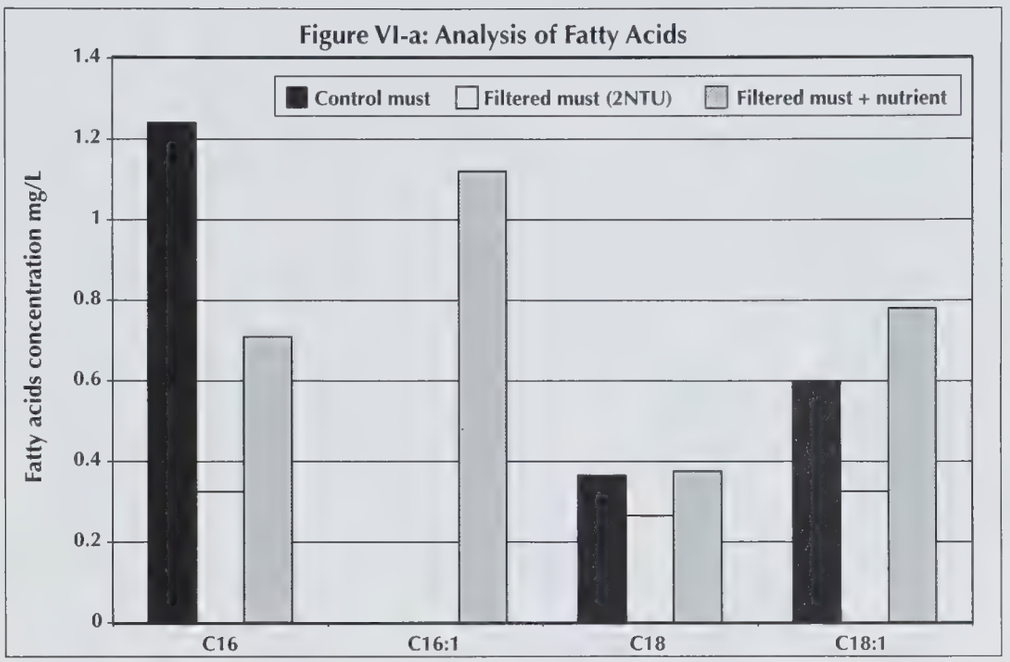
cium panthothenate decreases the risks of H_2S production and improves fermentation kinetics.[38] When the calcium panthothenate increases from 10 to 250 g/L, yeast EC1118 decrease the production of H_2S from 1,520 to 480 g/L in a presence of 60 mg/L of yeast assimilable nitrogen (YAN) and from 2,200 to 46 g/L in a presence of 250 mg/L of YAN.

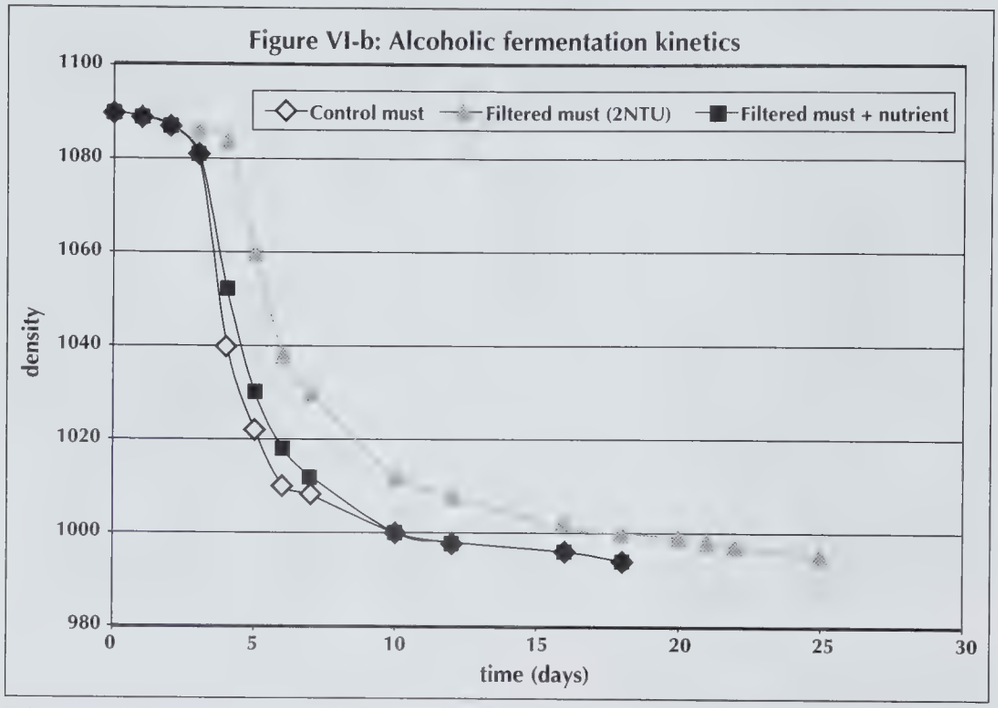
Biotin increases the production of esters, improves fermentation kinetics, and also yeast viability towards the end of alcoholic fermentation.[7]

Minerals such as magnesium, zinc, manganese, copper, and potassium are growth factors and thus play a significant role as they help yeasts to resist external stress. The importance of such minerals should not be overlooked as they play many important roles in enzyme pathways, metabolic pathways, and fermentation control.

With regards to vitamin and mineral deficiencies, a commercial preparation should be supplemented.



Influence of filtration rate and addition of complex nutrient on fatty acid concentration in Chardonnay must.



Influence of filtration rate and addition of complex nutrient on fermentation speed of Chardonnay must.

Nitrogen

Nitrogen is present in grapes in different forms: ammonium cation, amino acids, polypeptides, and proteins; only the ammonium cation and the amino acids are utilized by the yeast. The nitrogen concentration in juice varies according to cultural practices and climate. Juice nitrogen levels are not always sufficient to ensure a healthy alcoholic fermentation.

A juice is considered nitrogen-deficient when its concentration is below 150 ppm.[12] In nitrogen-limiting circumstances, it is important to supplement the juice with enough nitrogen in order to complete fermentation.

Nitrogen is an essential element for yeast nutrition and plays a major role in yeast cell physiology. Yeast biomass is directly proportional to the amount of assimilable nitrogen in the must.[3] The higher the concentration of nitrogen the faster the fermentation.[4]

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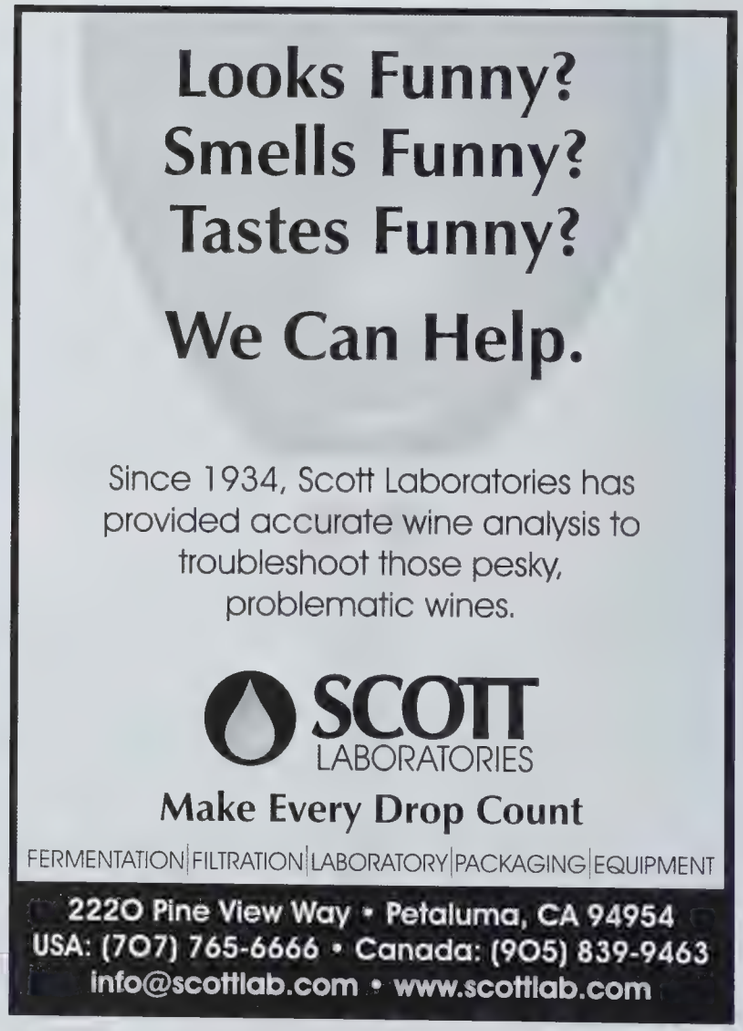
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Ammonium cations, which can be assimilated very easily by yeast, are responsible for cell growth and participate in the synthesis of amino acids. Amino acids play an important role with regards to the synthesis of proteins and thus, the success of the alcoholic fermentation.

Nitrogen plays another important role in yeast metabolism. It is involved in the synthesis of sugar transport proteins.

As the nitrogen concentration in the juice decreases during alcoholic fermentation, there is less nitrogen available for the synthesis of these sugar-transport proteins. The observed decrease of the sugar transport rate is proportional to the decrease of the nitrogen concentration in the medium.[35] This is a natural limiting physiological phenomenon, which generally leads to sluggish and then stuck fermentations.[8,34]

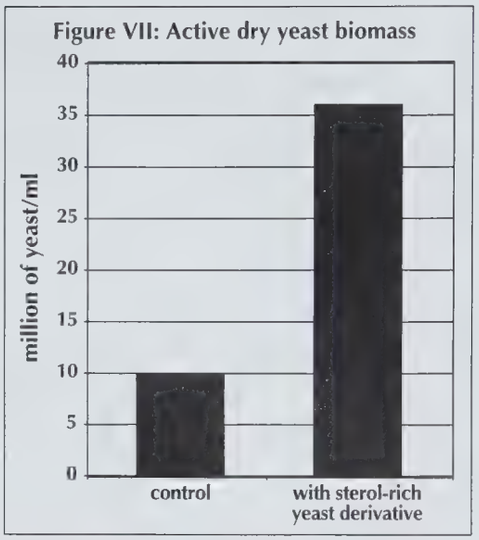
Certain researchers observed variability with regards to the efficiency of nitrogen additions according to the nitrogen source used. Indeed, 40 ppm of amino acids from inactivated yeasts are enough to maintain the fermentation rate between 20 and 100 g/L of sugar consumed during the stationary phase, when 80 ppm of ammonium ions are required.[20]

Essentially, it is recommended to add ammonium ions after yeast inoculation for cell multiplication, inactivated yeasts (a source of amino acids) for the onset of the fermentation, and finally, inactivated yeasts midway through alcoholic fermentation to reactivate protein synthesis and sugar transport.

In addition to the fermentation kinetic advantage, nitrogen management is also important for the organoleptic qualities of a wine.

It is known that production of H_2S is linked to the course of the alcoholic fermentation. The mechanisms of H_2S production by yeast is complex.[11]

H_2S can be produced under different circumstances: a nitrogen or vitamin deficiency can inhibit the metabolic production of sulfur amino acids. However,



Improvement of cell viability at the end of fermentation by use of yeast derivatives rich in sterols during yeast rehydration. Trial was on Chardonnay must, lightly-racked (alcohol 13%, pH 3.09, turbidity <30NTU).

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too much nitrogen may lead to a retro-inhibition of the metabolism, in which case, the sulfur ions, which are not used by yeast, are excreted as H_2S.

The challenge is to supply yeasts with an adequate quantity of assimilable nitrogen, which is neither too low nor too high.

Ammonium ions are rapidly assimilated by yeast. A significant addition to nitrogen-deficient juice can lead to a strong population growth. Upon depletion of this nitrogen source, the deficiency will be all the more important and H_2S production high.[13] Significant additions of ammonium ions can lead to a high increase of temperature due to the start of fermentation, and cause death of yeasts if the temperature exceeds a critical level.

The advantage of using inactivated yeast-based activators is they contribute nitrogen to the juice in the form of amino acids that yeast assimilate much more slowly than ammonium ions. This nitrogen source generates a regular consumption and prevents sudden excesses or deficiencies. In practice, once a deficiency in the nitrogen level has been determined, adding ammonium ions can lead to an increase in the production of H_2S when compared with an addition of amino acids from inactivated yeast/ complex nutrient additions.[14]

Another advantage of using inactivated yeast, which are naturally rich in amino acids, rather than ammonium ions: amino acids are precursors of positive aromas, which are formed by yeast.

Amino acids are converted into Keto acids by a transaminase and a glutamate dehydrogenase. Then, Keto acids are converted first into aldehydes by decarboxylation, and later into higher alcohols by reduction. Finally, higher alcohols are converted into esters through a reaction with wine acids. These esters have pleasant fruity or floral aromas such as peach, banana, grapefruit, pineapple, red fruit, and rose.

Tasting results of a trial carried out with a 2001 Muscadet from the Val de Loire, showed that the wine vinified with an addition of a complex activator during yeast inoculation and midway through the alcoholic fermentation was more intense with significantly more citrus fruit and floral characters compared to the wine vinified with an addition of ammonium salts (Figure III). In addition, the complex nutrition seemed to decrease vegetal character which was displayed in the control.

Analysis of negative (acetoin, ethanal, ethyl acetate), neutral (higher alcohols), and positive (esters) compounds of a 2006 rosé Syrah (Vin de Pays d'Oc) showed that the rosé vinified with an addition of a complex activator during yeast inoculation and midway through alcoholic fermentation was not significantly different from the control with regards to negative and neutral compounds. Whereas, the ester concentrations presenting banana, peach, citrus fruit, roses, pineapple characters were significantly higher than in the control (Figure IV).

Thus, the optimized management of yeast nutrients, due to use of complex nutrients, certainly confers more aromatic intensity and wine complexity.

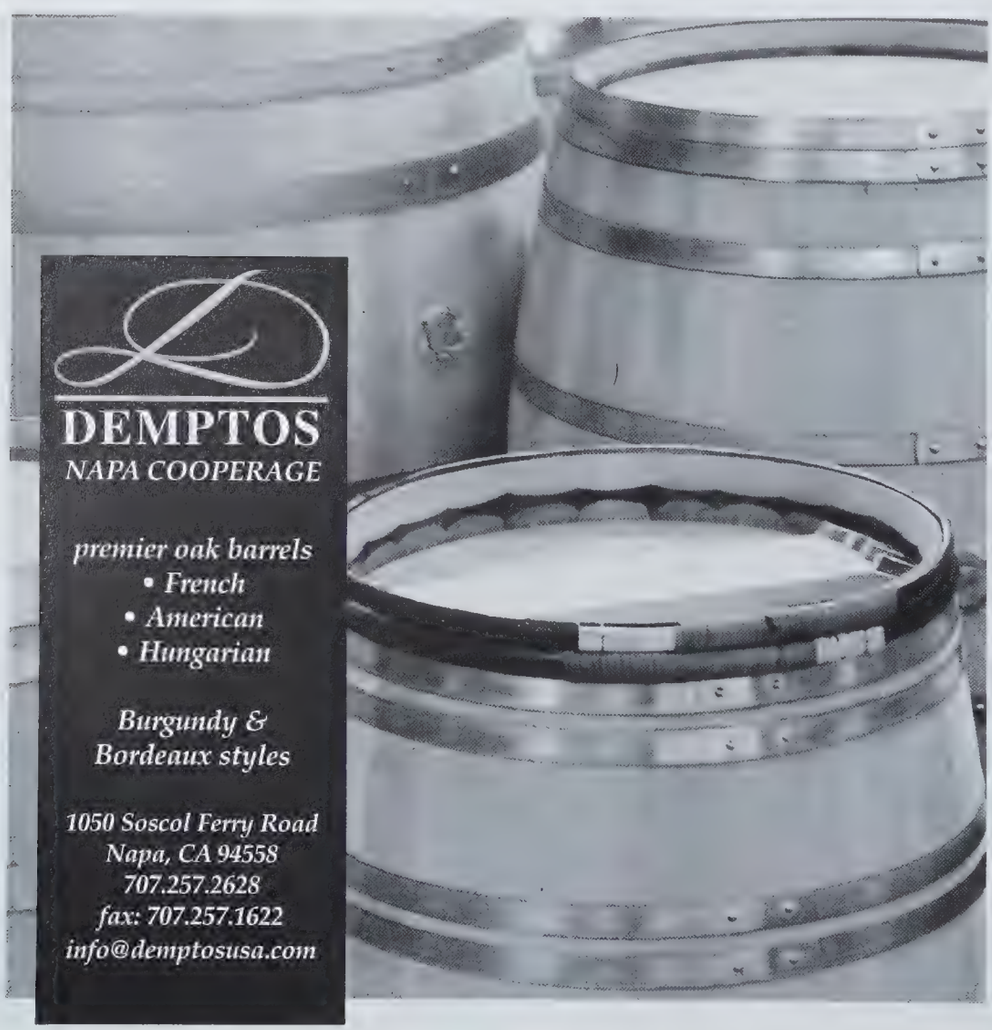
Lipids

Lipids do not directly influence the start of fermentation per se: they act as survival factors (such as C18 unsaturated fatty acids). These compounds help to protect yeasts against external stress.

During alcoholic fermentation, yeast produces toxic C6, C8, and C10 saturated fatty acids which can inhibit sugar transport, hence alcoholic fermentation.

The presence of C18 unsaturated fatty acids, which are naturally found in juice, can bind these inhibitory fatty acids. However, the majority of these survival factors are removed with the sediment during clarification.

A study in Alsace and Val de Loire (2002) showed that a severe clarification can remove the greater part of the lipids present in must (Figure V). Depending on must turbidity, the concentration can reach about 100 ppm. Clarifications often decrease the lipid



concentration below the threshold of 2 ppm under which the juice is considered as deficient.

Thus, in highly clarified musts, we observe a longer alcoholic fermentation and sometimes sluggish fermentations, which may lead to problems of lactic spoilage and oxidation. In order to bind the C6, C8, and C10 inhibiting fatty acids, it is possible to use an external source of unsaturated fatty acids; yeast hulls are the most efficient.[15]

A laboratory trial showed that addition of a complex activator had a positive effect on the lipid concentration of a juice. Figure VIa shows the amount of lipids in a highly clarified Chardonnay juice (micro filtration) and in the same juice after addition of a complex activator. As predicted, filtration significantly decreases the amount of lipids. Utilization of a complex activator containing yeast hulls restored the optimum lipid concentration.

The effect of filtration on fermentation kinetics is very clear. Lipid depletion in the medium leads to a slower start of fermentation and a longer, more drawn out completion of fermentation. An addition of lipids through the utilization of a fermentation activator allowed the fermentation to continue as expected (Figure VIb).

Sterols are part of the lipid family. They are integrated into the yeast membrane. Their role is to strengthen the plasma membrane and protect the yeasts against external stress (high alcohol concentration, extreme temperatures, low pH).

Yeasts are able to synthesize sterols due to a mechanism which uses oxygen, hence the interest of aerating during alcoholic fermentation. Work by P. Ribereau-Gayon *et. al.* demonstrated that the most efficient sugar consumption was when the yeast were supplied with oxygen 48 hours after inoculation at a rate of 8.43 mg/L.[33]

Under extreme conditions (high alcohol, low temperatures) or severe sterol deficiency (highly clarified musts), which happens frequently during an aromatic white wine vinification, it is also possible to supply the yeasts with sterols by using bio-reactivators rich in sterols during yeast rehydration (such as Enoferm Protect).

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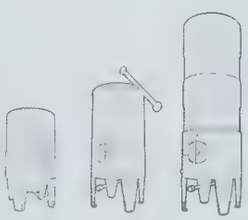

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Such Bio-reactivators allow for an increase in the yeast viability towards the end of alcoholic fermentation and thus, helps to avoid a difficult end to the fermentation.[36]

In the case of a highly-clarified Chardonnay, utilization of bio-reactivators during yeast rehydration resulted in 3.5X more viable yeasts toward the end of the fermentation compared with the control (Figure VII).

Conclusion

There are many considerations for vinification of an aromatic wine.

First, it is necessary to extract natural grape aromatic compounds and preserve them during the entire vinification. Additionally, the conditions under which alcoholic fermentation occurs strongly determines wine aromas. A good alcoholic fermentation management regime allows you to fully reveal the grapes' aromatic potential, to promote production of positive fruity and floral aromas, and to limit production of negative aromas such as sulfur compounds and volatile acidity.

It is important to remember that the grape quality determines the quality of your future wines and by applying good fermentation practices and managing your fermentation choices and manipulating the various enological tools we can allow that quality to be upheld and expressed. ■

The trials were made with the following enological products:
ADY 3 = Vitilevure 58W3
Complex nutrient = Actiferm P1 P2
Yeast derivatives rich in sterols = PreFerm

Acknowledgment: *The authors would like to thank Méditerranée Oenologie (Poussan, Fr), Gresser Oenologie (Andlau, Fr) and LVVD (Vallet, Fr) laboratories for their participation in the trials.*

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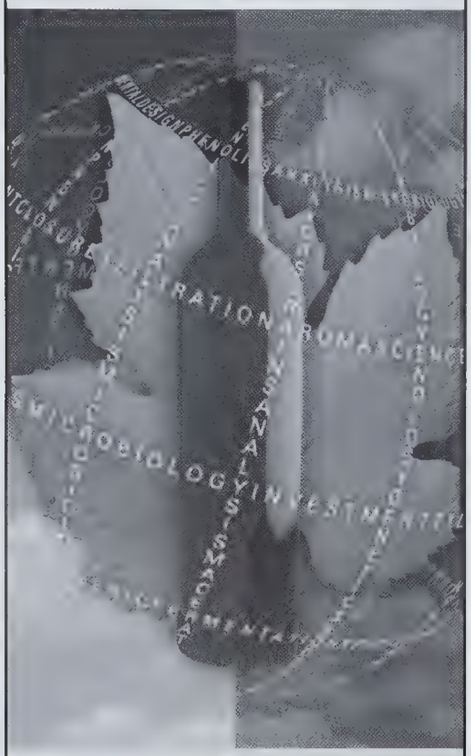

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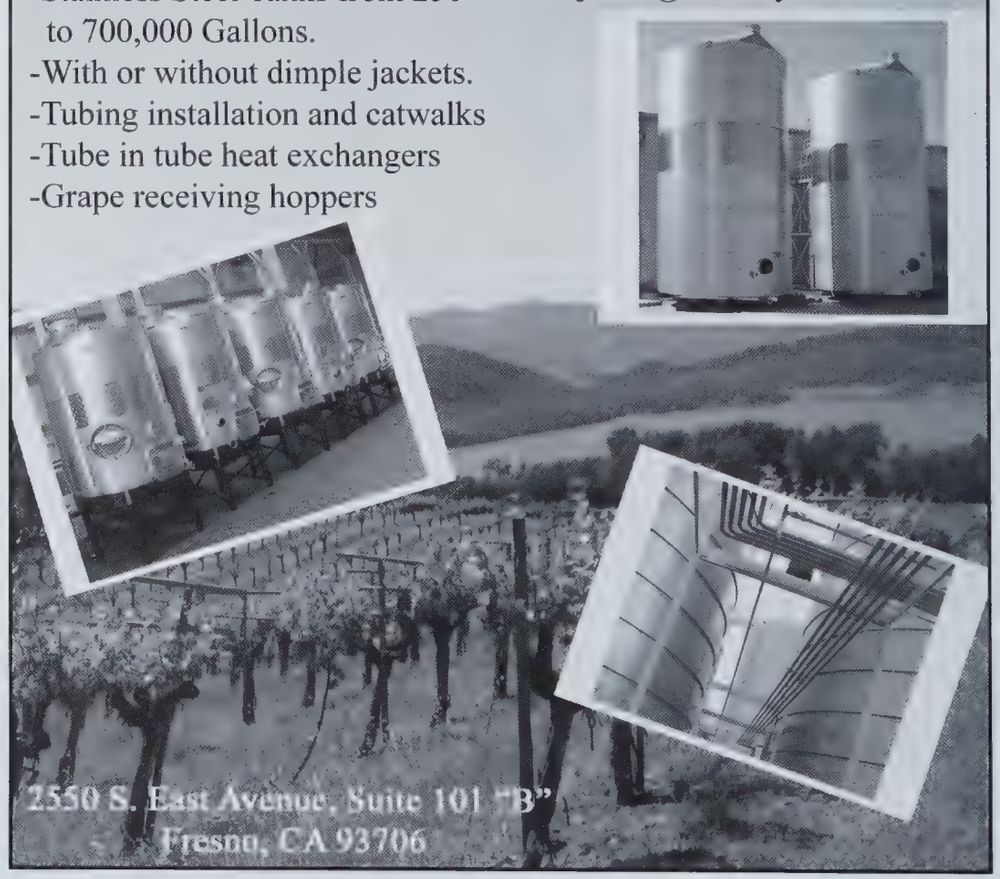

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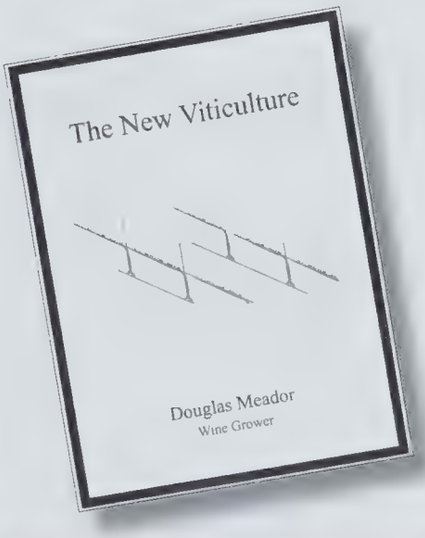

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Protectable trademarks for packaging

BY J. Scott Gerien,
Dickenson, Peatman & Fogarty,
Napa, CA

When one thinks of the word "trademark" one usually thinks of brand names — GALLO, ROBERT MONDAVI, or SUTTER HOME. Of course, this is logical as the brand name is usually the primary source-identifier for a product.

However, trademark extends beyond just the name of the product and there are legally protectable rights in other identifying elements of a product or service.

The legal definition of a trademark is: a word, name, symbol, or device, or any combination thereof, used in commerce to identify and distinguish the seller's goods or services from those of others. This is a fairly broad definition, but is entirely appropriate considering the various triggers of brand association in the mind of consumers.

Some symbols may function as trademarks in and of themselves, such as the shape, color, or graphics of product packaging. Others may have no individual trademark significance, but when combined together create a protectable trademark, also known as a "trade dress." Trade dress represents a certain "look and feel" for a brand or its packaging.

For example, the color pink has been used exclusively by Owens-Corning for its ceiling insulation and therefore functions as a trademark for that product.

However, when not used in an exclusive, source-designating manner, color can have no trademark significance, although it may provide functional information about a product, such as the color green for lemon-lime soda. In between these two ends of the spectrum are trademarks for color that provide exclusivity in the context in which they are used, functioning in the manner of trade dress.

Veuve Clicquot owns a U.S. trademark registration for the color "orange-yellow" for its Champagne label, based on its use of this mark in U.S. commerce since 1877. However, Veuve Clicquot's use of orange-yellow goes beyond its label and is also prevalent in its advertising, marketing, and corporate image.

Thus, if another producer of sparkling wine attempted to make extensive use of orange-yellow for its brand, or even as the dominant color for its label, Veuve Clicquot would surely have a claim for trademark infringement. However, this does not mean a winery's use of the color orange-yellow in combination with other colors as part of a distinct label design with a distinct brand name would be actionable, unless such use evoked Veuve Clicquot in the mind of consumers.

Like color, other symbols besides logos can also function as trademarks based on their prevalent use on packaging and in advertising and promotion.

Since the introduction of its first wine in 1972, Clos Du Val has used a distinctive swirling line design, which is found in its Three Graces logo and carried out as a background on back labels, on wine carriers, and in other promotional materials.

The prevalent use of these distinctive swirl designs allowed Clos Du Val to register the swirl design as a trademark separate and apart from the brand name or other elements of its packaging. While Clos Du Val cannot lay claim to all swirly designs, its trademark registration allows it to be able to stop any other winery from using a similar swirly design or swirly design theme.

When discussing trade dress in the wine industry, one must include the famous *Kendall-Jackson versus Gallo* "Turning Leaf" case. In 1996, E&J Gallo Winery debuted its Turning Leaf wine brand. Its label featured a multi-colored, die-cut grape leaf design on a cream-colored background with gold border, a bottle with a flanged-lip,

Packaging at issue in 1997 Turning Leaf dress case.

exposed cork, no capsule, with a brown neck-label (also with a gold border).

For several years prior to 1996, the flagship wine of Kendall-Jackson Wine Estates also featured a multi-colored grape leaf design within a rectangular cream-colored label with a gold border on a bottle with a flanged-lip, exposed cork, no capsule, with a brown neck-label and gold border. Several elements of the trade dress were introduced at different times; the multi-colored leaf in 1983, other package changes thereafter.

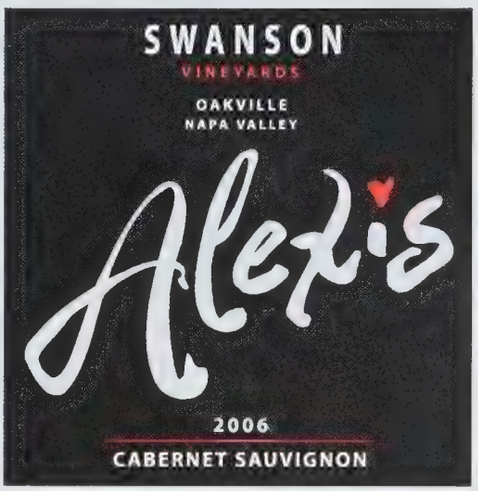
There were obvious differences between the packages, most notably the shapes of the grape leaves and brand names, Kendall-Jackson and Turning Leaf.

However, there was an arguably similar "look and feel" between the two packages and Kendall-Jackson was receiving calls from consumers suggesting that the Turning Leaf brand was being perceived by them as a second-label brand from Kendall-Jackson.

While the judge found sufficient similarity between the packages to reject Gallo's summary judgment request for a ruling as a matter of law, the jury ultimately found in favor of E&J Gallo and rejected Kendall-Jackson's claims of trade dress infringement.

An example of a dispute where the similarity of the trade dress at issue was perhaps more obvious than in the Turning Leaf case involved the label design for Alexis Cabernet by Swanson Vineyards (Oakville, CA).

In 1996, Swanson introduced a distinctive label design for the Alexis wine. The label featured a black background with the Alexis name in a distinctive white handwriting style with a red heart over the letter "i," with "Swanson" in gold lettering above,



and the vintage, style, and origin in gold lettering below.

In 1999, Swanson Vineyards personnel discovered a "Nicole" Languedoc red wine from France that appeared to have appropriated all of the graphic elements of the Alexis label, albeit with a different brand name.

When contacted by Swanson Vineyards, the French producer agreed to change the label on future vintages and Swanson agreed to allow the French producer to sell through the limited amount of offending wine that had already been imported into the U.S.

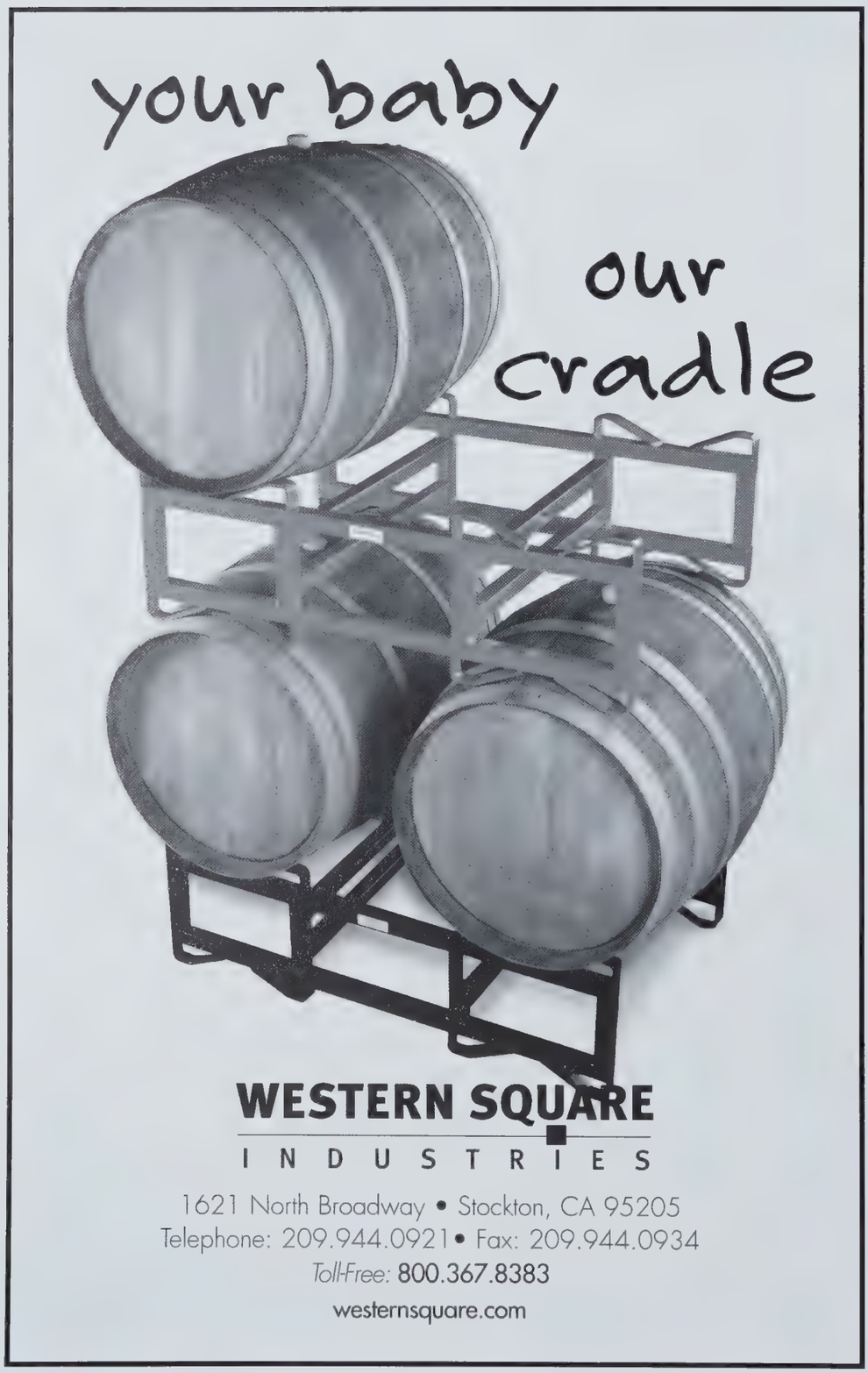
While there are those people who will undoubtedly take the position that there was no infringement in the Alexis case because the alleged infringer used a different brand name for a distinctly different type of wine, the law clearly suggests otherwise.

Take-home advice to brand owners

Consumers, in general, have an imperfect recollection of brands. This is especially true in the wine industry, where the total number of wine brands in the U.S. market at any one time easily exceeds 5,000. Accordingly, when a product has a distinctive "look and feel," consumers may be more likely to remember the trade dress than the brand name. Thus, trademark law provides protection for distinctive trade dress and trade dress elements to promote fair competition and safeguard consumers.

Wine brand owners should keep in mind the legal protections for trade dress in defending their own brands and should also respect the rights of others in the adoption of new labels and package designs. This article is not meant to suggest that every label or package design is unique and protectable, because it is not.

However, when a label or package design is "inspired by" that of another, or certain distinctive elements of a label or package design are "borrowed," then you are at greater risk. This is something to be especially mindful of when your labels and package designs are not



created in-house, but rather by outside vendors.

On the other side of the field, to the extent your label or package design is distinctive or unique, be sure to protect that uniqueness or it becomes diluted, non-distinctive, and open to use by others.

Trade dress can be registered in the same way as a brand name, and while it is not necessary, it serves to put others on notice as to your trade dress rights and your intent to protect them against infringement. However, to the extent such rights are disregarded, you must also enforce them to fully protect them.

If Veuve Clicquot had allowed other sparkling wine producers to freely use its orange-yellow trade dress, its consumer recognition and market position would not be what it is today. Undoubtedly, this distinctive trade dress element is as valuable as the Veuve Clicquot name, but only because Veuve Clicquot has acted to protect its distinctiveness. This is a valuable lesson in brand protection. ■

[J. Scott Gerien has represented wineries and vineyards on trademark matters for more than twelve years. He is head of the intellectual property department of Dickenson, Peatman & Fogarty (Napa, CA), a member of the DP&F's wine industry practice group, and Chairman of the International Trademark Association's North American Committee on Geographical Indications. He may be reached at 707/252-7122 or sgerien@dpf-law.com.]

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VARIETAL REVIEW

California Rosé by design: whole cluster pressing not saignée

BY Eleanor & Ray Heald, Contributing Editors

Winemakers in the U.S. dislike comparisons of their wines to their French counterparts, yet it's predictable that this occurs. With Rosé, it is inevitable.

In the southern France region of Provence, a Rosé is not a wine by-product made by the saignée method, which involves bleeding off a portion of a fermentation tank after only a short period of juice contact with red grape skins.

Since half of the Rosé made in France comes from Provence and 80% of Provence wine is Rosé, ***PWV Journal*** discusses Methode Provençale or direct-press (in wine English) techniques with winemakers ascribing to the method. Essentially, they eschew the saignée method and cite its wine drawbacks.

Methode Provençale is a term that Julien Fayard (Azur Wines, Napa, CA) created to refer to the style of Rosé he crafts — from the way grapes are grown to winemaking practices. He adheres closely to the way Rosé is made in the most southern part of Côte de Provence, which includes the well-known region of Bandol.

"The method," Fayard says, "results in a very specific wine color and the way to extract it. The grapes are grown intentionally to make this Rosé style."

Strictly speaking in Provence, Methode Provençale refers only to a Rosé made from Syrah, Cinsaut, Mourvèdre, and Grenache. For this varietal review, it refers to a direct to press technique applicable to Pinot Noir, also.

How is it possible, then, to make a Rosé with Provençal finesse and the allure of California fruit character? Fayard continues that, for him, "it's rediscovering how to make the Methode Provençale style with different parameters. A California style comes from the fruit and richness achieved."

Chris Phelps (Swanson Vineyards & Winery, Rutherford, CA), who along with Fayard makes a Syrah Rosé, has been making wine in Napa Valley for 25 years. He notes that he's always trying to bridge the gap between Old World and New World wine styles. "California direct-press Rosé generally has more alcohol when compared to Provence, where 13% is high end, a higher pH, and lower acidity."

Another part of it, Jeff Virnig (Robert Sinskey Vineyards, Napa, CA), who makes a Pinot Noir Rosé (called Vin Gris) adds, "we're all making a wine that is not a by-product of something else. It's Rosé by design. Whole-cluster pressing is important.

"When a winemaker chooses a saignée style Rosé, it doesn't have the balance because picking focuses on different parameters for the resulting red wine. In Sinskey's case that's Pinot Noir, where harvest parameters mean higher pH, lower acidity, and overall different characteristics than we're seeking for a Rosé of the same variety.

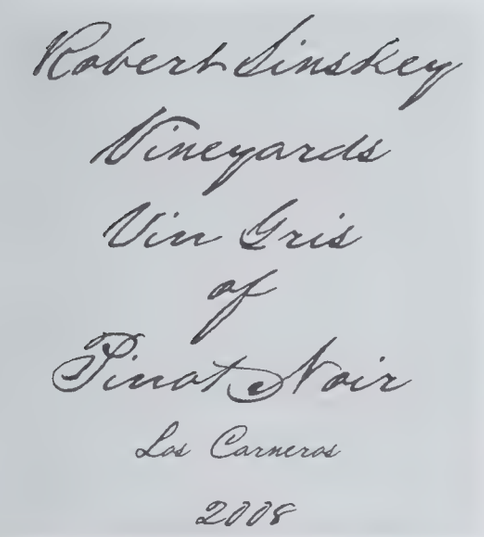
"Typically, when picking at low sugar, high acidity, and low pH, there is high malate content, and to retain crisp acidity, we do not put the Rosé through malolactic fermentation (MLF)."

In producing their dry Rosé, none of the winemakers interviewed do.

Dry Rosé by design

Picking parameters, notes Phelps, are the fundamental differences in producing a Rosé by design. For Swanson's 2008 Rosato (a Rosé of Syrah), grapes are picked at 21.5° to 22° Brix compared to 25° to 27° Brix for the Syrah table wine. Azur averages 24° Brix, Sinskey 22.7° to 23.3° Brix, and Etude 22° to 22.5° Brix.

"Aroma and taste profiles," Phelps contends, "are completely different. Rosé has strawberry, watermelon, and floral



14.1% alcohol, 3.37 pH, 6.2 g/L TA

perfumed elements — very delicate characters that we know, if we wait and pick at higher Brix, we are going to get some funk, licorice, and black fruits, which are not attractive in a Rosé."

14.1% alcohol

Picking Pinot Noir early, Jon Priest (Etude Wines, Napa, CA) adds, "is the only way to achieve high-toned aromatics that we don't get otherwise. In a red wine, we're looking for ageability, richness, and depth. For a Rosé in California, our biggest challenge is acidity to achieve balance and freshness.

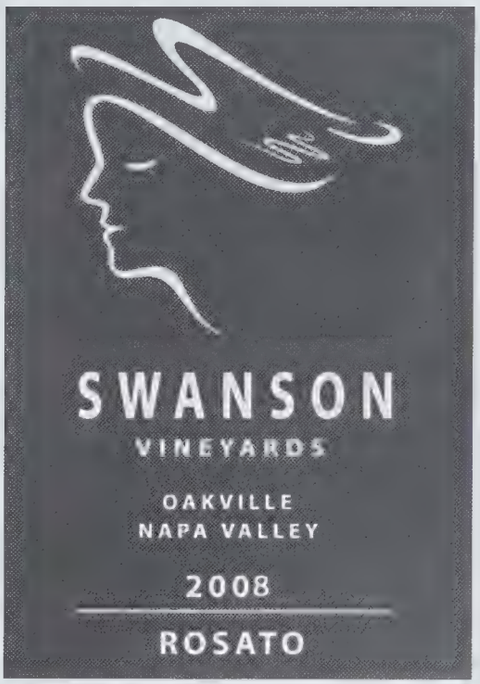
"Picking at lower parameters (Brix and pH) offers Etude a distinctive quality to the wine of minerality from the rocky, volcanic, and clay soils in the Grace Benoist Vineyard (in the northwest corner of the Los Carneros AVA, bisected by the Rodgers Creek Fault Line at the southern toe of Sonoma Mountain). When Pinot Noir is riper, we can lose that element of expression in the nose."

14.0% alcohol, 3.33 pH, 7.45 g/L TA

Objections to saignée

Higher alcohol, lower acidity, and higher pH are Virnig's main objections to the saignée process. "It leads to clunky, indelicate wines."

Fayard counters that he believes it's possible to make a delicate saignée Rosé, "but the winemaker must significantly



13.5% alcohol, 3.5 pH, 6.1 g/L TA

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work on the wines technically. A lot of wineries make a saignée Rosé to save gallonage — not to put it down the drain. Since it's already a by-product, not as much attention is paid to the wine as the way the four of us are doing it."

Phelps notes that the obvious goal, in his opinion, of making a saignée Rosé is to improve a red wine. "Whether or not it does in all cases, that's the concept."

Virnig suggests that subtlety, needed for a Rosé, is lost as red grapes rise on the ripeness scale.

Etude Pinot Noir is fermented as a red wine with a large fraction of whole clusters. Priest contends that a saignée Rosé from this fermentation can become stemmy and is more structured.

"We should also note," says Phelps, "that making a Rosé by design is an economically unviable decision. Think about a table wine Syrah from the Oakville AVA. It will command $30 to $50 per bottle and Swanson sells its Rosé for $20. So, hats off to the owners of the wineries we work for, who are committed to producing Rosé wines."

Priest points to the expense of Rosé by design because the winery cannot ask as much for the wine. Etude is using low-yielding Pinot Noir that could potentially go into a $42 bottle of table wine.

Priest asks: "Are we focused on the maximum red wine potential of the grapes? Perhaps, but it's important to us because the Rosé completes our wine portfolio and illustrates another way to express Etude Pinot Noir."

Fayard adds that although there is a range of pricing for Rosés, the market does not know the difference. "It's all Rosé. We're trying to stand out by elevating communication that there's a Rosé price that's linked to the approach used from vineyard to bottle."

One monetary advantage that Virnig sees is that there is no expensive 15 to 18-month barrel regime. Sinskey bottled the 2008 vintage in January 2009 and released it in late March / early April.

Pink is cool

"We discuss marketing aspects," Priest says, "but I don't know if that's necessarily a point of distinction from a consumer aspect. People buy wines that they appreciate and enjoy. If the winemaking process is setting it apart — then great."

To enhance the color of Etude Pinot Noir Rosé, 2% still Pinot Noir wine is added.

Beyond the consuming public, Phelps tosses in distributors, retailers and other persons selling wine. "We're always looking for important points of distinction and Swanson Rosato is one of those points. If Rosé continues to gain momentum as a category, we can easily increase production."

Virnig does a flashback. "Fifteen years ago when wineries released a Rosé, consumers confused it with white Zinfandel. Sinskey started out (1991) making only a few hundred cases of Rosé by design because we wanted a special wine for summer. We've increased to 1,800 cases and depending on the size of the vintage, 3,000 cases,

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"Pink was not cool, but now it's back in vogue."

Phelps cautions that it's still an uphill battle. "The western and southwestern U.S. should be a no-brainer because Rosé by design is so versatile and suited to warm climate."

Because of a greater proximity to Europe, the east coast according to Fayard, has caught on more than the Los Angeles market. "East coast consumers are more educated about European wines and wine styles. Yet, in the broader market, it's still a hand sell. When sommeliers get interested, they carry the word and educate consumers."

Clonal selection and soil

For Etude Pinot Noir Rosé, Priest utilizes two clones. Dijon 777 is notable for its aromatic lift, verve, and softness from a Tuscan Cobbly Clay soil with good water-holding capacity and drainage. Pommard (UCD 5) offers depth and minerality from a site that has a clay/calcareous rock soil profile at the summit of a windy cold hill.

Sinskey Pinot Noir Rosé comes from two of the winery's vineyards. The Old Sonoma Road property was planted to Dijon clone 114 for its higher acidity. Is it? "Maybe a little," Virnig answers.

Virnig cites Pommard (UCD 4) as a preference along with the "S Selection," cuttings from Jim St. Clair's Vineyard on Los Amigas Road in the Los Carneros AVA, now planted in Sinskey's Vandal Vineyard.

Sinskey Vineyards are certified organically grown (CCOF) and Demeter BTA grown. In Los Carneros, the vineyards were virgin soil, less than 1% organic matter, and anaerobic with significant clay. Increasing organic matter in the soils since 1991 has been a priority.

Fayard has not done clonal research yet, but points out that he makes judgments more on soil type than clones or selections. "It comes down to the blending aspect, fruit from different soil profiles offers unique components. Diversity comes from soil and location. For Syrah, sandy and granitic soils offer minerality, freshness, and palate length."

One entire block of Swanson's Estate Vineyards in Rutherford is a Syrah field selection committed to production of Rosato.

Beyond grapegrowing parameters

Independent of variety, winemakers cite specific viticultural practices for a Rosé by design.

At Swanson, Syrah was planted originally for red wine using quadrilateral cordon on a lyre system. Phelps notes that small crop load is not preferred. "Heightened floral and fruit characters come with yields around 4.2 tons/acre (TPA). Less than 3.5 TPA throws the balance of the resulting Rosé out of whack and I would be happy with up to 5.5 TPA. We have achieved that yield and the wine seems to be even better. Higher yields ease the pain of low margins on this wine."

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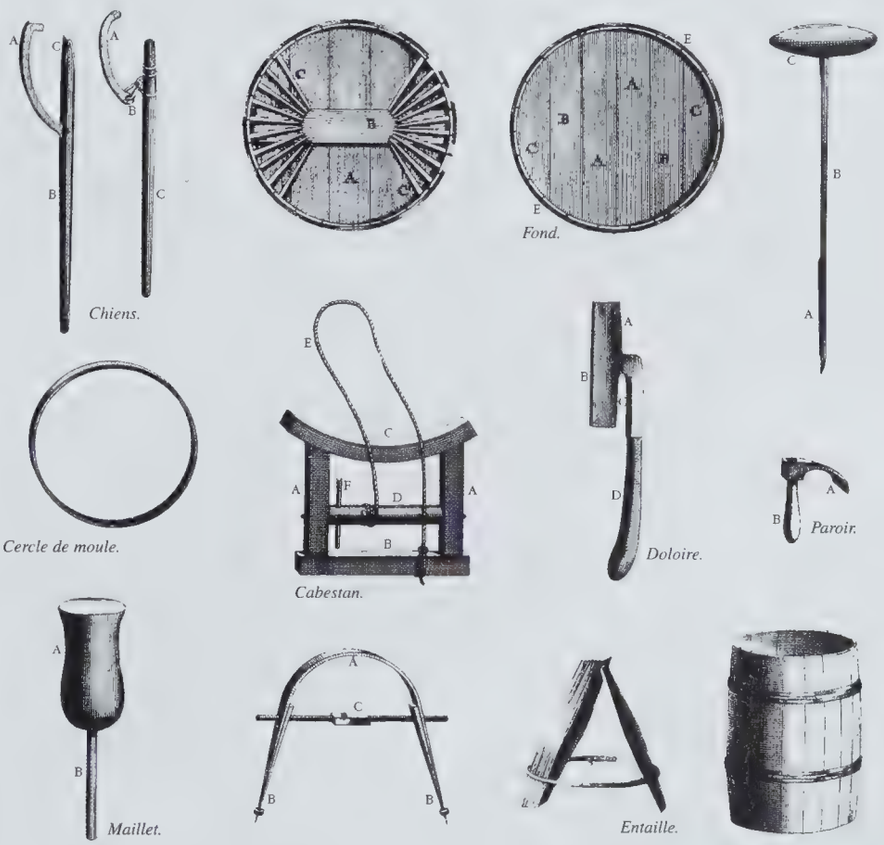

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Sinskey's yield averages 3 TPA. There are vintages with higher yields and Virnig does not mind "more hanging out there." As with most of his vines, he does not like to see a totally denuded fruit zone.

Fayard suggests that in addition to harvest parameters, avoiding sunburned fruit is important and he cautions against vigorous deleafing.

Because color is not a primary issue, Priest notes that to preserve acidity, vines can have more shading. Leafing is related more to controlling disease pressures than anthocyanin development. Winemakers agree that removing laterals is often sufficient leaf removal.

Vine spacing is important only in that it achieves vine balance. When the vineyards were planted, Rosé by design was not a consideration.

When this discussion occurred in February 2009, drought conditions were on the horizon. Winemakers said that they were irrigating their vineyards and mowing cover crops. "We cultivate these blocks anyway," Priest affirms, "and we will get a head start on that."

"We believe in March miracles," remarks Virnig. "In a number of years, we've made up a serious water deficit and filled our irrigation ponds in March. In vintage 2006, we had 40 days of rain between March and April. Contrast that with 2008 when most of the rainfall was complete by the end of February, yet we went into deficit mode by August."

Sulfur dioxide addition

Either in the press pan or as soon as juice is in the tank, Phelps adds 30 ppm SO_2. Priest's method is similar with 25 ppm. Phelps, though, desires to retain a redder color of Syrah Rosé and finds that SO_2 preserves it. The juice temperature is initially maintained at 55°F to 60°F for addition of pectinase to aid settling, then chilled for settling, which for interviewed winemakers ranged from 48 to 72 hours.

Since Virnig does not add enzymes, he prefers 72 hours of settling. Sinskey Vineyards are estate and the fruit is picked very clean, so Virnig does not add SO_2 and has not had the need. Juice is held between 40° and 45°F and the volatile acidity at bottling is quite low (.021 g/100 ml). In certain vintages where there may be more rot, Virnig might add 30 to 40 ppm SO_2.

Fayard routinely adds 20 ppm.

Whole cluster pressing

Phelps, Priest, and Virnig direct-press whole clusters.

Because of the way Fayard learned to make Rosé when he worked in his native Provence, he at first, destemmed and pressed whole berries. However, with his California-sourced fruit, he has significantly riper stems and skins, so going direct-press creates a more interesting wine.

Average juice yields from whole cluster pressing range from a low of 140 gal/ton at Azur to a high of 160 to 165 gal/ton at

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Robert Sinskey. Mid-range are Swanson (148 gal/ton) and Etude (150 gal/ton).

Skin maceration time was answered with a chorus of, "as long as it's in the press (generally a two to three hour press cycle)."

Fermentation

Yeast culture preferences vary by producer. Phelps chooses Fermol Blanc at 2 lbs/1,000 gal because, with it, he does not experience H_2S, while floral, red fruit, and citrus characters are enhanced.

Priest's choice for Etude is W-15 which captures red fruit aromatics.

With significant success as a "work horse," Virnig inoculates with QA-23, but has used PDM in vintages where he anticipates fermentation problems. He cites M-2 as resulting in stuck fermentations when overall juice balance is lacking. Fermentation takes 21 to 28 days at a sweet spot temperature of 58°F that allows 1° Brix drop per day.

Below and above 58°F, Virnig notices too much H_2S production.

Fermentation at Swanson takes 25 to 30 days at 50°F. Phelps notes that long fermentation preserves delicate aromatics. If it rips through in half that time, they are blown off.

Since Fayard cannot temperature control juice, but uses a cold cellar and starts fermentation swiftly and it completes in 10 to 15 days to avoid stuck fermentation in 200-gal fermentors.

Priest starts fermentation in tank, then barrel ferments Etude Rosé in seasoned (10-year-old) cooperage in a cold cellar. "We try to protract fermentation as long as possible, yet have the confidence that it's going to go dry."

Post fermentation to bottling

Once fermentation in barrel goes dry, Etude wine is maintained at 25 ppm free SO_2 and remains in barrel on fine lees for two to three months until after the Christmas holidays when it's transferred to tank and begins a stabilization process. It's bottled at the end of February with 25 ppm free SO_2 and 40 ppm total.

Once Virnig is certain that the wine is dry, he adds 50 ppm SO_2. Lots are blended in November when there is tank space available. Unless gross lees are detected to be stinky, wine is not racked until time of blending. Bottling is done in January at 32 ppm free SO_2 and 85 ppm total.

Fayard's practice is to add 40 ppm SO_2 (aiming for 22 ppm free in the bottled wine) once fermentation completes. Wine is fined with Bentonite at that time and filtered before blending. "I focus on minimum manipulation, so instead of racking off the fermentation lees, doing a fining and transferring back to tank. The wine is racked only if a reduction problem is detected." Wine is bottled at the end of March.

When fermentation completes, Phelps adds 50 ppm SO_2 (aiming for 32 ppm free). It's racked clean in January, bentonite fined, cold stabilized, and sterile bottled in mid-February at 30 ppm free SO_2 and 70 ppm total.

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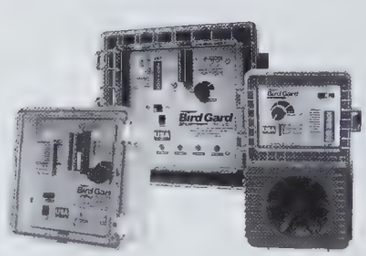

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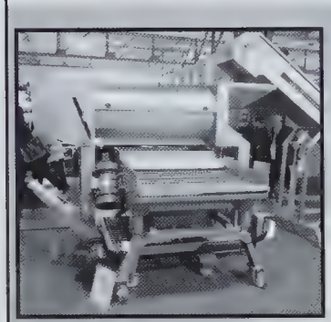

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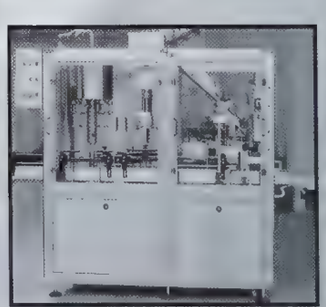

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Last drop

In his tasting notes, Jon Priest remarks that he found two of the Rosé by design wines in the tasting remarkably similar to 2007 Domaine de Terrebrune Bandol Rosé, contributed as a point of discussion by Kermit Lynch (importer).

Although there are site personality differences, Priest's findings are not really so surprising. Bandol soils are diverse and ***PWV Journal*** reviewed California Rosé wines from a number of different vineyard sites with varying soil compositions.

A principal characteristic of the Bandol appellation is stone-like dryness and low fertility, often calcarious soils in parcels situated on hillsides only, as required by the appellation.

Annual Bandol precipitation of 23.5 inches/year, coupled with 3,000 hours of sun exposure, often leaving vineyards in water deficit near the end of summer. Sound familiar? ■

TASTING NOTES

2007 Etude Rosé of Pinot Noir, Carneros Estate — $20

Color/Aroma: Salmon hue, light cranberry/ Lightly floral, rose petal, slight cherry, ripe, lush strawberry, citrus, and blood orange.

Flavors: fresh, ripe, succulent red fruits, red berries, citrus, and mineral.

Balance: bright acidity and good mid-palate.

Finish: layered, refreshing, and elegant.

2008 Robert Sinskey Vineyards Vin Gris of Pinot Noir, Carneros — $24

Color/Aroma: Light salmon, appropriate for a Vin Gris. Mineral, delicate, very nuanced, hint of lemony citrus, stone fruits, watermelon, and uplifted peach-nectarine.

Flavors: Lively, lemon-lime zest, exotic mango, tropical fruit, and pink grapefruit.

Balance: Slight CO_2 livens palate impression, bright acidity.

Finish: Expressive and refreshing with fine texture.

2007 Azur Wines California Rosé — $24

Color/Aroma: Light salmon/ honey, toasted bread character, hints of grapefruit, and stone fruits.

Flavors: Delicate flavors blend nicely with dried cherry in finish.

Balance: Well-balanced mineral component, mouthfilling.

Finish: Crisp, long, round, and all about structure.

2007 Swanson Rosato, Oakville, Napa Valley — $18

Color/Aroma: Light garnet/ Apricot, strawberry, slight hint of mint, pink grapefruit, watermelon, and almond paste.

Flavors: Apricot, strawberry, cherry, Meyer lemon, and rhubarb.

Balance: Nice mid-palate weight.

Finish: Crisp. Overall bigger style that's food versatile.

2007 Domaine de Terrebrune Bandol Rosé — $23

Color/Aroma: Deep, pink salmon/ Similar to the Azur, floral, mineral, graphite, peach, nectarine, and leathery.

Flavors: White wine esters, strawberry, sweet rich fruit, and orange peel.

Balance: Mouthfilling with low acidity.

Finish: Medium body, similar to Sinskey in terms of Vin Gris mineral aspect, fresh, fluid, good acidity and backbone.

PWV Journal *thanks winemaker Jon Priest and Etude Wines for hosting the discussion/tasting.*

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WINEMAKING

Risk control and alternatives

Pre-fermentation maceration in red winemaking

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Low-temperature pre-fermentation maceration or cold soaking in red winemaking consists of allowing the must to macerate on the skins for a variable length of time before alcoholic fermentation, generally at a temperature below 15°C (60°F).

Extraction of compounds from the skins in this aqueous medium is different from the process that occurs in a hydro-alcoholic medium during and after alcoholic fermentation, as alcohol acts as a solvent and is capable of extracting tannin from seeds, protected by a lipid cuticle.[1] As anthocyanins and skin tannins are relatively soluble, they are extracted during maceration in an aqueous medium.[2]

In addition to phenolic compounds, cold soaking extracts varietal aromas and aroma precursors, and other molecules, such as polysaccharides. From an empirical standpoint, this technique was considered to produce fruitier red wines. It has become highly successful amongst growing numbers of winemakers and has been investigated in recent research.

B. Pineau *et al.* demonstrated that macerating red grape skins from Bordeaux grape varieties in a model medium, with no fermentation activity, was responsible for the development of a fruity character.[3]

Maceration prior to alcoholic fermentation is certainly not risk-free and requires compliance with some elementary rules.

Even if precautions are taken to avoid the microbiological risks described in this article, the grapes must be healthy and at optimal ripeness. Maceration accentuates extraction of the compounds responsible for moldy, earthy off-odors,[4] and release of laccase.

Finally, cold soaking should not be considered if the winery does not have the necessary equipment for rapid refrigeration (under 24 hours), capable of reaching and maintaining a temperature below 10°C (50°F). This key point is, unfortunately, frequently ignored by winemakers, who take ill-advised risks that could result in serious spoilage of their wine. It should be noted that, even in properly sulfured must, there is huge pressure from indigenous microflora at this stage. The diversity of microbial flora on grapes is now well-known.[5]

Yeast and bacteria are present in quantities of 10^3 to 10^6 CFU/grape, with the various populations in differing proportions, according to the condition of the grapes. *Brettanomyces* spoilage yeasts have also been detected on grapes,[5] and may take advantage of pre-fermentation maceration to acclimatize to the medium, as illustrated by the results in Table III. This point is examined in detail below.

When the winery does not have the necessary equipment or the winemaker wishes to shorten cold soaking without loosing its benefits, pectinase-based enzyme preparations represent a very useful alternative. Indeed, progress in biotechnology and more detailed knowledge of the location of grape molecules have led to the development of enzyme preparations that act as real selective extraction tools.

Exogenous enzymes on grapes mainly contain activities found naturally in grapes and may be added to the must to accelerate extraction by selective hydrolysis of the pectins. These new enzyme preparations gently degrade the cell wall structure of grape skins allowing a more effective liberation of tannins and polyphenolics. In particular, some of them increase color intensity by promoting polymerization of the anthocyanins and catechins.[6]

However, commercial enzyme preparations are not all equally effective. Each enzyme acts on specific substrates and some preparations are not purified to eliminate undesirable activity (beta-glucosidase activity, which destabilizes anthocyanins by forming aglycones, or cinnamyl-esterase activity, responsible for the formation of volatile phenol off-odors).

This article describes microbiological risks associated with cold soaking and presents the results of comparative tests using pre-fermentation maceration and enzyme preparations on a winery scale.

Microbiological risks associated with cold soaking

The major risk in cold soaking is microbiological. Premature growth of indigenous flora may hamper development of selected yeasts added later in the process. The data presented in Table I illustrate this risk: an ADY/indigenous population ratio of 100 is required to guarantee successful inoculation.

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11:15 Distribution and Shipping Updates

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5:30 Questions and Answers, Followed by a Reception

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Table I: Development of ADY in must: ADY / indigenous population ratio[7].

ADY / indigenous population ratio	0.1	1	10	100
Probability that the ADY would develop in the must	0.1–1%	15%	95%	100%

The proliferation of indigenous flora correlates with the maceration temperature (Table II). While temperatures above 10°C (50°F) are more favorable for extracting and stabilizing color, cold soaking must be performed at low temperatures (below 8° to 10°C [50°F]), to avoid development of indigenous flora present in the must and prevent spontaneous fermentation.

Not only do indigenous species deplete nutrients in the medium, they are also perfectly suited to conditions in the must. As a result, when the ADY are added to the must, they have to compete to occupy the same ecological niche. Indeed, not only do the grape microorganisms that have survived the osmotic shock of crushing rapidly consume the available nitrogen, and the growth and survival factors available in the must (sterols, vitamins, minerals, etc.), but they also enhance their capacity to adapt to the medium during maceration.

For example, Figure I shows the population growth of total yeasts and non-*Saccharomyces* yeasts during seven days cold soak at 10°C (50°F).[5] Non-*Saccharomyces* yeasts were in the majority during maceration and remained at high levels during fermentation, despite development of *Saccharomyces* yeasts. As these yeasts are perfectly adapted to the medium, their growth metabolism resumes as soon as the *Saccharomyces* start to decline.

V. Renouf showed that, among non-*Saccharomyces* yeasts, *Brettanomyces*

Table II: *Saccharomyces cerevisiae* proliferation time according to temperature[7].

Temperature (°C)	15	20	25	30
Generation time (h)	8	4	3	2

bruxellensis was in the minority when the must is put into tank but represented a majority after fermentation, as it was extremely resistant to conditions in the medium.[5]

Apparently *Brettanomyces bruxellensis* at the beginning of maceration enhanced their capacity to take over from *Saccharomyces* at the end of fermentation. In addition to adapting more easily, these microorganisms may also cause off-odors, due to production of volatile acidity by bacteria or volatile phenols by *Brettanomyces bruxellensis*. Phytotoxins or fermentation inhibitors may also be produced if cold soaking is not properly controlled.[8]

Table III: Cabernet Sauvignon Cold Soaking 8°C / 4 days — *Brettanomyces* yeast count before and after maceration. (Results in CFU/mL, counted after culture on enrichment medium)

D0 (tanking)	< 10
D4 (after CS)	**$2.2.10^3$**

Table IV: Cold Soaking Merlot 14°C / 3 days: Yeast population before and after cold soak. (Results in CFU/mL, yeast population counted on specific agar medium).

	Tank A *Yeast added after CS*	Tank B *Yeast added after CS*	Tank C *Yeast added before CS*
Before CS	$1.6.10^3$	$1.2.10^3$	$1.5.10^3$ (before yeast added)
At the end of CS	$3.9.10^5$ (before yeast added)	$8.0.10^5$ (before yeast added)	$1.5.10^5$

SO_2 addition to the grapes is an excellent method for controlling populations of indigenous flora in the must. However, it is not advisable to add excessive SO_2 to the must (depending on condition of the grapes), as this may lead to difficulties later in fermentation, indirectly facilitating development of *Brettanomyces bruxellensis*.

Excessive addition of SO_2, resulting in a wine with a higher total SO_2 content, delays growth of lactic bacteria and the beginning of malolactic fermentation (MLF), leading to a long lag phase, giving *Brettanomyces bruxellensis*, which is particularly resistant to SO_2, an opportunity to develop.

In view of all these factors, cold soaking is a risky technique. Temperature is one of the keys to success, as is when yeast is added. Several protocols for inoculating with yeast were studied.

One hypothesis was that early inoculation with selected microorganisms of the medium would enable them to colonize the microbial ecosystem, thus inhibiting development of the indigenous flora responsible for spoilage. Yeast inoculation before cold soaking and in several stages was compared with adding yeast after cold soaking.

Controlling microbiological risks: Importance of inoculation time to ensure proper growth of ADY

Comparison of inoculation before/after cold soak

One lot of Merlot (Bordeaux, 2006) was divided evenly among three tanks. The must contained: potential alcohol

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Table V: Cold Soaking Merlot 14°C / 3 days: Results of the mid-fermentation yeast development tests.

	Tank A *Yeast added after CS*	Tank B *Yeast added after CS*	Tank C *Yeast added before CS*
Monitoring yeast development *(PCR and electrophoresis)*	**Negative: medium not colonized by the inoculated strain**		**Positive: medium colonized by the inoculated strain**

Table VI: Cold Soaking Merlot 14°C / 3 days: Analytical profiles of wines after alcoholic fermentation.

	Tank A *Yeast added after CS*	Tank B *Yeast added after CS*	Tank C *Yeast added before CS*
Alcohol (% v/v)	13.80	14.05	13.95
Reducing sugars (g/L)	**4.4**	**3.9**	1.6
Volatile acidity (g/L H_2SO_4)	0.36	0.40	0.39

14% v/v (25° Brix), Total Acidity 3 g/L H_2SO_4 (4.7 g/L tartaric acid), 3.5 pH, free SO_2 30 mg/L, total SO_2 62 mg/L, malic acid 2 g/L, assimilable nitrogen when must put into tank (65 mg/L). These were particularly difficult conditions with a high potential alcohol and severe nitrogen deficiency.

The temperature in all three tanks was maintained at 14°C (57°F) for four days. Yeast was added to tanks A and B after cold soaking, but to tank-C before cold soaking. All three samples were inoculated with the Zymaflore® RB2 yeast (20 g/hL, 200 ppm) rehydrated with Dynastart® yeast rehydration nutrient (30 g/hL, 300 ppm).

Diammonium phosphate (DAP) was added to each tank in two stages: ½ at the end of cold soaking and second ½ after one-third of alcoholic fermentation, totaling 70 g/hL (140 mg/L assimilable nitrogen for the yeasts).

The yeast population and assimilable nitrogen content were measured before and after cold soaking (Table IV). Although the must in tanks A and B, where yeast was added after cold soaking, was properly sulfured, there was a sharp increase in the population of indigenous flora (x 2.10^2 to x 7.10^2 UFC), which was responsible for significant consumption of assimilable nitrogen in the must (Figure II). As a result, when the yeast was added after cold soak-

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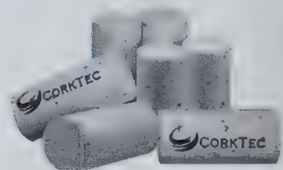

ing, very little nitrogen was available for the ADY.

Furthermore, the ADY had to compete with large quantities of indigenous flora that were already acclimatized to the medium.

In tank-C, inoculated with yeast before cold soaking, the yeast (ADY) population increased by a factor of 10 during maceration, thus achieving the desired effect of colonizing the medium with the selected inoculated strain, without triggering alcoholic fermentation. By the end of cold soaking, a large amount of the available nitrogen in this tank had been consumed by the ADY, so post-maceration addition of DAP was advisable to start fermentation.

Yeast development, assessed by genetic analysis at mid-fermentation, was positive for tank-C and negative for tanks A and B (Table V). In these two tanks, one or more indigenous strains were responsible for alcoholic fermentation. The inoculated yeast strain did not develop, in spite of addition of 20 g/hL (200 ppm) yeast, so the medium was colonized by one or more indigenous strains, with unknown capacity to achieve a complete alcoholic fermentation.

Table VII: Cold Soaking Cabernet Sauvignon 15°C / 3 days: Yeast population in the various samples: results in cell/mL, counted by epifluorescence microscopy)

	Tank A *Yeast added before CS*	Tank B *Yeast added in 2 stages*	Tank C *Yeast added after CS*
D 0: before CS	$9.4.10^4$ (before yeast added)	$3.1.10^4$ (before 1st yeast added)	$1.5.10^4$
D 3: after CS	$1.2.10^7$ (fermentation started)	$1.5.10^6$ (before 2nd yeast added)	$3.1.10^5$ (before yeast added)

Inoculation at 20 g/hL (200 ppm) generally adds 2.10^6 cell/mL (depending on the quality of the ADY), which, in this test, represented a population only 5 to 10 times larger than the indigenous population in tanks A and B when yeast was added (after cold soaking).

The probability that ADY would develop properly, with a population under 10 times larger than that of indigenous flora, was very low (Table I). As a result, in this trial, the indigenous population after maceration was so large, active, and perfectly adapted to the medium that adding 10 times as much ADY was insufficient to ensure that the inoculum could develop.

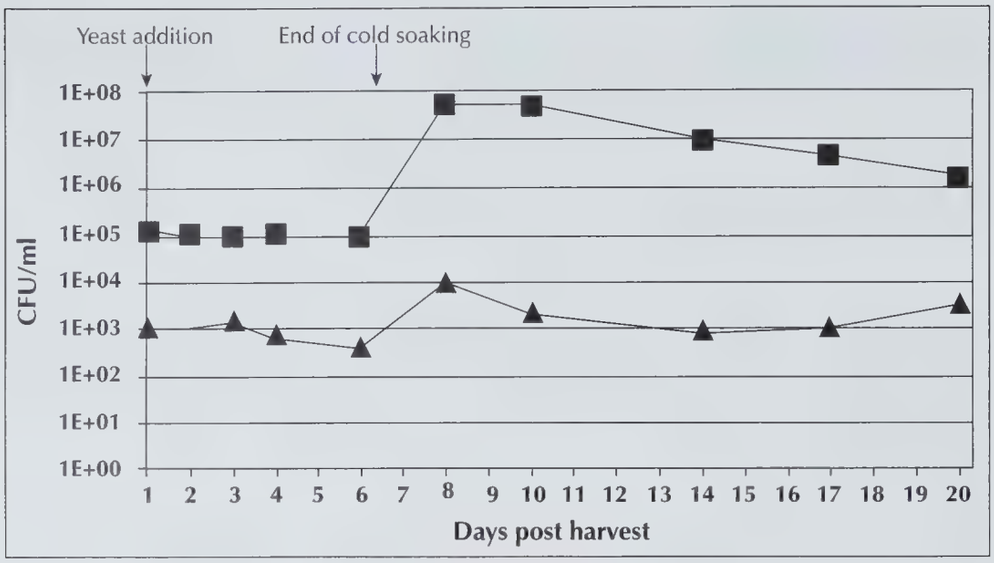

Figure I: Changes in the total yeast population (■) and non-Saccharomyces yeasts (▲) in a batch of 2003 Merlot during 7 days' initial low-temperature maceration[5].

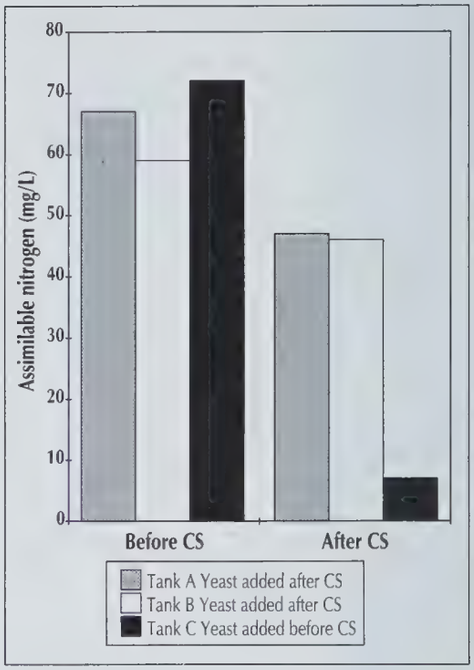

Figure II. CS Merlot 14°C / 3 days. Assimilable nitrogen content before and after CS.

The indigenous flora prevented the selected yeast from developing and colonizing the medium. In these two tanks, yeast activity stopped before all the sugars were consumed (Table VI) and a starter was required to ferment the remaining sugars.

The indigenous strain or strains responsible for alcoholic fermentation (AF) were not, therefore, resistant enough to complete fermentation. Fortunately, the wine in tanks A and B did not have high volatile acidity or any off-odors frequently caused by this type of competition. However, the difficulty in completing fermentation in the two tanks delayed MLF.

Comparison of adding yeast before/after cold soak in several stages

For wineries that do not have the proper cooling equipment but still wish to do pre-fermentation maceration, the addition of yeast must be adapted to minimize microbiological risks.

One way of doing this is to add yeast in two stages, before and after cold soaking. To illustrate this technique, below are the results obtained during a test fermentation of a batch of Cabernet Sauvignon (Médoc, 2007). A

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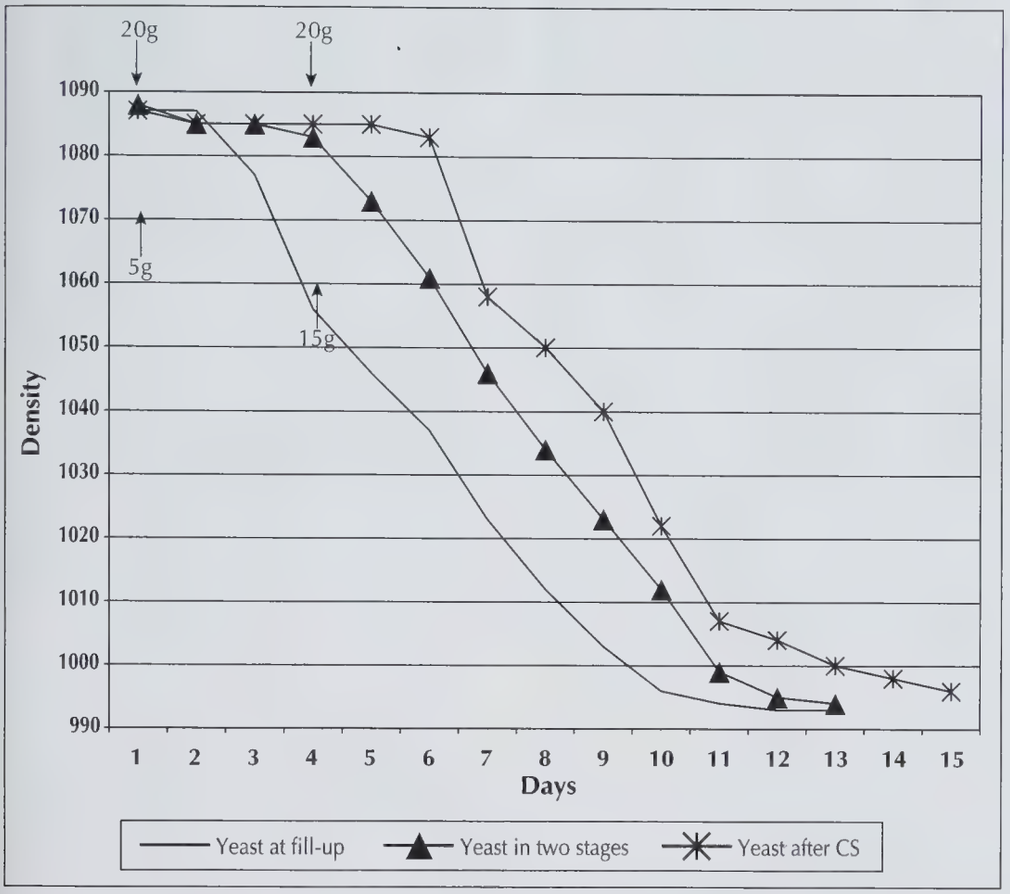

Figure III: Changes in fermentation kinetics in the various samples. Control (——, no cold soak); cold soak with yeast added in stages (▲); cold soak with yeast added after maceration (✳).

batch of must was divided into three samples:

Tank-1: yeast added before cold soaking, no cooling.

Tanks 2 and 3: maintained at 15°C (59°F) for three days (cooled by adding dry ice),

Tank 2 was inoculated in two stages with the same yeast strain: 5 g/hL (50ppm) [0.4 lbs/K] before and 15 g/hL (150ppm) [1.25 lbs/K] after cold soaking,

Tank 3 was inoculated with 20 g/hL yeast after cold soaking. The yeast strain was Zymaflore FX10®.

In tank-2, adding 5 g/hL yeast (approximately 5.10^5 cell/mL) before cold soaking resulted in gradual colonization of the ecological niche by the selected strain without triggering fermentation. The yeast population at the end of cold soaking was still below the threshold for triggering alcoholic fermentation (2.10^6 cell/mL), see Table VII.

The second addition of yeast, before the temperature in tank-2 started to rise, caused fermentation to start rapidly (Figure III). The importance of adding yeast as soon as possible after cold soaking should be emphasized: the temperature should not be allowed to increase before inoculation of the tank.

In the sample inoculated before cold soaking, the yeast population increased by a factor of 1,000 during the three-day maceration and alcoholic fermentation started one day after inoculation (Table VII, Figure III).

When yeast was added after cold soaking, the indigenous flora proliferated during maceration (Table VII). This tank experienced a long lag phase before fermentation started and a slowdown towards the end of AF (Figure III). The inoculated yeast failed to develop. This was due to competition between the selected and indigenous yeasts, as previously described.

In order to guarantee successful growth of ADY, it is also essential to acclimatize the yeasts. While it is important to add yeast as soon as possible, it is also true that ADY must be

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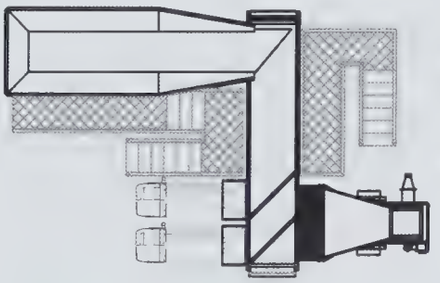

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gradually acclimatized, especially when it is inoculated into cold must. It is, therefore, vital to reduce the temperature of the yeast inoculum by several additions of must, so that the temperature difference between the yeast preparation and the must in the tank does not exceed 10°C.

Similar results were obtained in a 2006 trial when yeast was added to a Syrah must (southeastern France) in several stages (five days cold soak at 12°C [53.6°F]). As this trial was successful and the winery wanted to continue to do cold soaking, this two-stage technique for adding yeast has been adopted by the winemaker.

Even when microbiological risks are under control, cold soaking is an expensive technique. First, it requires adequate refrigeration equipment. Furthermore, as the total maceration period is longer, the winery must either have enough tank space, or plenty of time.

The addition of enzyme preparations was studied, with the aim of minimizing these constraints and reducing the time required for cold soaking, while retaining all the benefits.

Using specific enzyme preparations as an alternative to cold soaking

The aim of adding pre-fermentation enzymes in red winemaking is to accelerate selective extraction. This technique was compared to cold soaking.

For example, the results of a test at a Pessac Léognan "Grand Cru" (2006) are presented below. A batch of good-quality Cabernet Sauvignon was divided between two tanks. In the tank ENZ was added enzyme (4 g/100kg Lafase HE Grand Cru®) and yeast (20 g/hL ZYMAFLORE F15®) when the must was put into tank and temperature controlled to allow alcoholic fermentation to start quickly.

Tank CS was maintained at 70°F [21°C] for five days, then yeast added to the cold must after cold soaking (same yeast strain and inoculation rate). The other fermentation parameters were identical: temperature of AF, frequency and intensity of pump overs, post-fermentation maceration period, etc. After draining, both samples were stored separately and analyzed.

Table VIII shows the results in terms of free-run + press wine production and phenolic content after post-MLF SO_2 addition. Total wine yield (free-run and press) was improved by 31% by using the Lafase HE Grand Cru® enzyme preparation.

Standard analyses of the wines did not reveal any differences between the two samples (results not shown).

In terms of phenolics, the color of the enzyme-treated sample was 18% more intense than the cold soak sample. Similarly, the enzyme-treated sample had a higher tannin content (+22.5% compared to the cold soak sample). The tannins were also more polymerized (HCl index) than in the cold soak sample.

In view of the significant improvement of the total polyphenol index (OD 280) of the enzyme-treated sample, a more detailed phenolic content analysis of the wines was done by HPLC (Table VIII).

The wine in the enzyme-treated sample contained higher concentrations of polymerized phenolic compounds (tannins that remain more stable over time and protect the wine from oxidation), caftaric and caffeic acids (caftaric acid hydrolyzes to form caffeic acid, which plays a role in protecting wine color, by co-pigmentation with anthocyanins), and quercetins (yellow pigment from black grapes).

Addition of pre-fermentation enzymes resulted in a larger quantity of wine that generally has a more intense color, which remains more stable over time, and higher concentrations of more-polymerized tannins. In view of these results, the winery decided to use the same enzyme preparation on a systematic basis.

A similar trial was carried out in the same year using Merlot from Entre-Deux-Mers and a combination yeast/ enzyme of Zymaflore

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Table VIII: Cold Soaking Cabernet Sauvignon 5 days –7°C / Enzyme added. Yields of free-run + press wine / Analysis of the wines' phenolic content after MLF.

	CS Tank *Not enzyme-treated with CS*	ENZ Tank *Enzyme-treated without CS*
Yield of free-run + press wine	100% (reference)	131%
Modified Colouring Intensity	12.2	14.4
OD 280	78	82
Anthocyanins (mg/l)	743	726
Tannins (g/l)	4	4.9
HCl index (%)	29	35
HPLC analysis of phenolic content (+/– 5%)		
Gallic acid (mg/L)	52	60
Polymerized phenolic compounds (mg/L)	1029	1329
Caftaric acid (mg/L)	9	22
Caffeic acid (mg/L)	3	4
Quercetin glucoside (mg/L)	8	12
Quercetin aglycone (mg/L)	15	22

RX60®/Lafase Fruit®. The results were comparable to the Pessac Léognan "Grand Cru" Cabernet Sauvignon above. After three months ageing, a tasting was organized with 19 enologists. In a triangular tasting, 58% of the tasters found a difference between the two samples (results significant above 5%).

Descriptive analysis of the wines revealed statistically significant differences in terms of fruitiness, with a preference for the enzyme-treated sample. There were no significant differences between the two wines for the following criteria: olfactory intensity, softness, fruitiness on the palate, and length. The differences were still perceptible when the two batches had been bottle-aged for 18 months.

The results of these two trials demonstrated that the use of specific enzyme preparations (Lafase HE Grand Cru® and Lafase Fruit®) produced wines with comparable, or even better, analytical and tasting results to those obtained with low-temperature pre-fermentation maceration. This confirmed the results obtained during several seasons of

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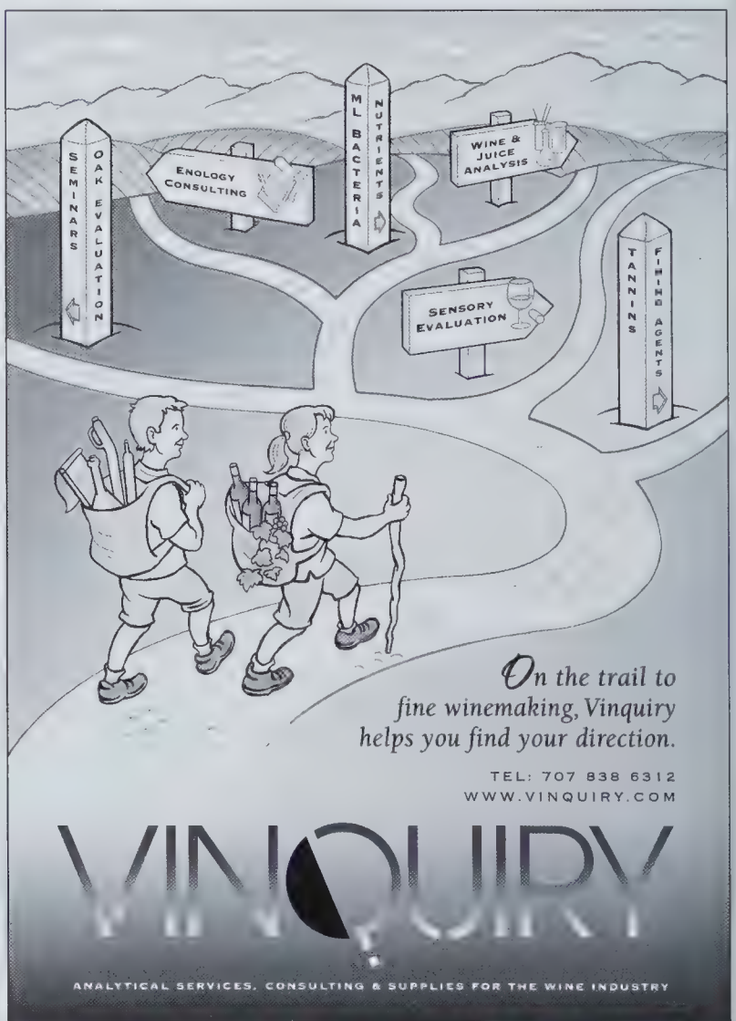

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Table IX: Comparison of the cost of using a specific enzyme preparation and chilling the must.

Chilling the must by adding dry ice	Using an enzyme preparation
CO_2 consumed per hL to cool the must by 10°C: 10kg Cost of CO_2 per kg: approximately 0.25€	Using 4G/100kg specific extraction enzyme preparation:
Total excluding the cost of maintaining the low temperatures for several days: 2.5€ / hL finished wine	**approximately 0.4€ / hL**

comparative tests of this type, in Australia, Italy, and the U.S.

Comparing the cost of these two techniques (Table IX), it was noted that using 4 g/100 kg maceration enzyme cost approximately six times less than refrigerating the must for cold soaking (excluding the cost of maintaining low temperature during maceration).

Conclusion

Although low-temperature pre fermentation maceration (cold soaking) produces fruitier wines, this technique involves microbiological risks: poor development of the selected strain, off-odors due to competition between native and selected populations, sluggish or even stuck fermentations, etc. The sine qua non condition for successful cold soaking is proper control of maceration temperatures.

To ensure development of the selected yeast strain, it must dominate the indigenous flora and minimize its growth from the beginning of maceration. For this reason, it is strongly advised to add at least some of the yeast before maceration, especially if the winery does not have a sufficient refrigeration system. The partial or total addition of yeast when the must is put into tank also minimizes the adaptation and development of spoilage microorganisms, such as *Brettanomyces.*

The use of selective enzyme preparations is an excellent alternative, which reduces maceration time and facilitates extraction of useful compounds in the aqueous phase, at a very affordable cost, potentially even lower than that of low-temperature pre-fermentation maceration.

Pre-fermentation enzyme-treatment produces wines which retain a fruitier character, even after several months ageing. Ongoing work in many enological research laboratories continues to provide more understanding of the phenomena involved in extracting compounds from the skins during the maceration phase. Particular importance will be

Continued on page 91

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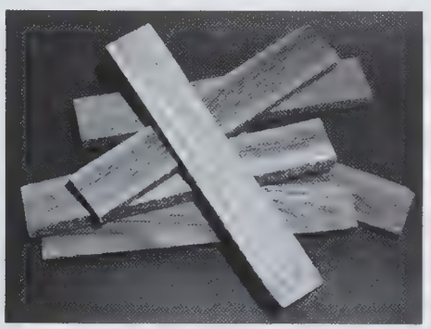

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UC researchers demonstrate potential use of pheromones in management of mealybugs

BY Jocelyn Millar, Dept. of Entomology, University of California, Riverside, CA,
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Kent Daane, Dept. of Environmental Science, Policy, & Management, University of California, Berkeley, CA,
Vaughn Walton, Dept. of Horticulture, Oregon State University, Corvallis, OR,
Monica Cooper, University of California Cooperative Extension, Napa, CA

Over the past decade, economic losses from mealybug infestations in California vineyards have increased dramatically. In addition to damage caused by the buildup of sooty mold on mealybug-excreted honeydew and insect detritus in bunches, mealybugs are also responsible for vectoring grapevine leafroll viruses that decrease yield and reduce winegrape quality.

The four most important mealybug species are the recently introduced and highly invasive vine mealybug *Planococcus ficus*, the grape mealybug *Pseudococcus maritimus*, the obscure mealybug *Pseudococcus viburni*, and the long-tailed mealybug *Pseudococcus longispinus*.

Overall, each species has distinct biological characteristics that result in differences in geographic/climatic ranges, host preferences, economic injury, and approaches to management. Until recently, vineyard managers had no simple and effective methods for monitoring these mealybug species.

It had been known for some time that sessile mature female mealybugs of all four species produced sex pheromones to attract tiny, winged males for mating. In 2001, University

Female long-tailed mealybug on the ornamental plant Ruscus (magnification 64x). Photo © Rebeccah Waterworth.

Triangular-shaped delta traps catch VMB with minimal risk to parasitoids. Photo © Rebeccah Waterworth.

of California researchers Jocelyn Millar, Kent Daane, and Walt Bentley began a project to identify these pheromones so that they could be developed for use as trap lures, in the same way that many lepidopteran pests are now monitored with pheromone traps.

The team first identified a pheromone for vine mealybug (in 2002), and it was immediately adopted for use in detecting new infestations as vine mealybug continued to spread into new areas of California. Since then, the team has identified the pheromones of the other three species.

Mealybug pheromone characteristics

These pheromones all share a number of desirable characteristics for use in pheromone trapping.

First, they are all very powerful attractants for male mealybugs, so that even small populations can be detected. This can also be a disadvantage because mealybugs have been caught in traps located over one-quarter mile from the nearest known infestation.

Male long-tailed mealybugs caught on pheromone trap. Photo © Rebeccah Waterworth.

Second, field trials have shown that the standard rubber septum type pheromone lures remain attractive for at least two months under field conditions, minimizing the number of lure changes required throughout one season.

Third, the lures require only a tiny dose of pheromone (0.025 milligrams or less), which will help to keep lure manufacturing costs down.

The fourth characteristic is both an advantage and a disadvantage. That is,

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the chemical structure of each pheromone is different, so each pheromone specifically attracts only its own species.

The advantage is that if you see mealybug males in a trap baited with the pheromone for species X, you know immediately that these males must be species X, without having to try and identify them.

The disadvantage is that in vineyards with more than one mealybug species, you might have to put out separate traps for each species.

One further issue is that "grass" mealybugs (*Phenococcus* sp. and *Chorizococcus* sp.) have been caught in pheromone traps baited with the vine mealybug pheromone in some North Coast vineyards. It is not yet clear whether they were attracted to the pheromone, or were simply present in such high densities that they were accidentally caught in the traps. This will be resolved soon in further field tests.

Generic lures to attract several species

Because more than one mealybug species can be present in a vineyard, the research team has investigated the possibility of combining pheromones to make "generic" mealybug lures that would attract all four species simultaneously, so that growers would only have to put out one trap, instead of one trap for each species that might be present.

With some types of insects, for example lepidopteran pests, using mixtures of pheromones would be risky because the pheromones can interfere strongly with each other, resulting in none of the target species being attracted to a lure containing a blend of the pheromones of each species. However, preliminary trials with mixtures of a couple of the mealybug pheromones have indicated that there is minimal interference, and the concept of generic mealybug lures for vineyards may be practical.

If there is no interference among any of these pheromones, then it will even be possible to make custom mixtures of the pheromones that contain only two or three pheromones, for vineyards where

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there are only two or three species present. However, it will also be necessary to check that non-target species of mealybugs, which are not of economic importance, are not cross-attracted to the pheromone lures, resulting in false positives.

Commercial development of pheromones

Currently, of these four pheromones, only the vine mealybug pheromone is commercially available, but Millar is working to transfer the manufacturing technology to companies that produce pheromone products.

None of the pheromones are protected by patents, so all are freely available for commercial development. However, companies also need to know that there is a substantial market for these products, so growers should communicate their needs to company representatives to expedite the entry of mealybug pheromone traps into the marketplace.

Control of mealybugs with pheromones

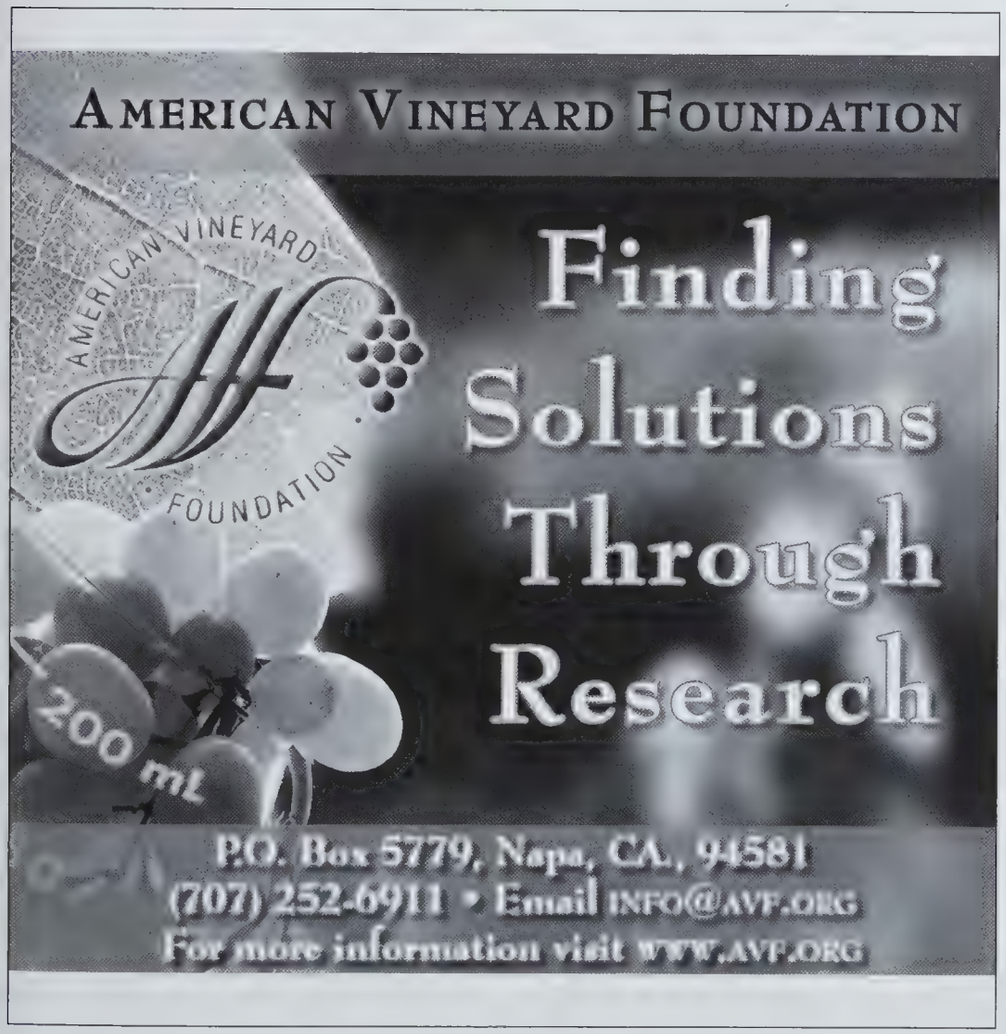
In addition to their use for detection and monitoring of insect populations, pheromones also have potential use in insect control, for example by mating disruption or attract-and-kill technologies.

Mating disruption trials conducted by Daane, Bentley, Cooper, and Millar have shown promising results for vine mealybug.

In 2008, the first commercial use of the CheckMate pheromone dispenser for vine mealybug mating disruption occurred using one formulation produced by Suterra LLC (Bend, OR), under a FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act), Section 18 exemption. Kent Daane applied for the exemption, which authorizes the U.S. Environmental Protection Agency (EPA) to allow an unregistered use of a pesticide or other agrochemical for one year if the EPA determines that an emergency condition exists with approval from the California Department of Pesticide Regulations.

The section 18 exemption for the vine mealybug pheromone has been approved for 2009 in Contra Costa, Fresno, Kern, Kings, Lake, Madera, Marin, Merced, Monterey, Napa, Sacramento, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Solano, Sonoma, Stanislaus, and Tulare counties.

An interesting aspect of this program is that a parasitoid of the vine mealybug (*Anagyrus pseudococci*) may be attracted to the mealybug pheromone as a host-finding cue, resulting in greater levels of biological control. The group has shown that there is minimal risk of parasitoids being caught if lures are deployed in triangular tent-shaped delta traps. ■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Crisis Leadership — What has the global economic crisis wrought?

BY Henry Work

All employees must be concerned about if, and when, the tentacles of the current global economic crisis might reach out to impact them or their job. Winery personnel should be concerned, especially as eroding profits are often overshadowed by brisk wine sales of the lower-priced wines, and the possibility of the government increasing the excise taxes on wine.

It behooves winery owners and managers to provide positive leadership, to keep winery staff fully apprised of the wineries' economic condition, and provide the motivation and emotional security necessary to keep people focused on their jobs.

Difficult times call for creative management in 2009. In addition to determining crop load on vines, researching what bottling equipment to purchase, and deciding how to overcome falling sales, clear leadership for all your stakeholders is critical. In these turbulent times, winery personnel need honest, accurate information to reduce stress and help them perform at their best.

Here are some tips for improving productivity through effective leadership.

Issues to be concerned about

Employee stress can arise from many situations or issues. One of the most obvious is concern about keeping their job when they see layoffs occurring around them. They wonder whether they will be let go, with the subsequent loss of income and security.

If layoffs are contemplated, employees need to be told, so that they can make adequate alternative plans. Failure to provide this information invites suspicion and rumors, which are far more deleterious to staff morale and production than allowing orderly planing for a possible layoff.

Another source of stress is when employees are asked to do too much in too little time and/or with too few resources. Employees are especially vulnerable when staff cuts have already been made and there are fewer employees to do the work.

Cuts in both staff and resources are inevitable during a business down cycle, so planning for these reductions should include a review of what tasks are non-essential, and brainstorming how to get by with a reduced budget.

Professor Stewart Friedman (2008), a director of the Leadership Program at the Wharton School of Business, suggests:

> "The knee-jerk response in an economic downturn is to wring greater productivity out of your workforce by making employees work harder. But this can hurt more than help, by fueling resentment and burnout. A smarter approach: Be open with employees about the **business** problems you face, and invite them to be part of the solution while encouraging them to meet critical needs in other parts of their lives. Do this right and you'll reduce stress, decrease wasted time, boost trust, build resilience, and improve productivity."[1]

In a classic organizational behavior research study by J. Stacey Adams, Equity Theory shows that we are all willing to row harder if everyone is rowing harder.[2] Put another way, we can accept hardships as a group, but when some people get preferential treatment, acceptance stops.

A boss needs to realize that he or she will need to tighten the belt along with any reductions asked of the staff. This could mean flying economy class instead of business class, reducing salary and/or bonuses, and expense accounts or vacation time. Remember, perception is just as critical as the real thing.

Company vision and mission statements — Are they accurate and is the company living up to them? Articulate frequently, to all stakeholders, the company vision and the reasons why things are being done the way they are. If you see head scratching, then review what you are doing, and what you are saying about what you are doing. It may be a good time to re-evaluate and make any changes necessary.

Honesty, even about bad news, allows employees to make intelligent and rational decisions. 72% of the respondents in a recent survey by business researchers Barry Posner and James Kouzes indicated that honesty was the number one trait that they sought in a leader.[3] The next highest trait was "forward thinking." For a manager this means being totally prepared for the next project(s), for mid-management it is looking several years in the future, and for senior management it is gazing into the crystal ball 10 years down the road. Easy to say, hard to do!

Communicate frequently with all staff, especially those in outlying facilities or vineyards. In uneasy times, the staff needs constant reassurance in terms of feedback on how they are doing. Provide the most cur-

rent sales, production, and financial information available, along with some analysis of it. The staff also needs to know that they are being listened to.

Develop listening skills — Sometimes the concerns of the staff are not well articulated, so careful listening and tactful, probing questions are necessary to find what's truly bothering them. Often it is just confusion about what is being said or what is expected. Restating the information, or having a short discussion, can clear the air.

For other issues, an adjustment in procedures, or a real policy change, may be required. In maintaining leadership, problems must not be swept under the rug. If employees complain about a real problem, then there needs to be a resolution, or a rational and legitimate reason why a correction cannot be accomplished.

Pay raises and bonuses — 2009 may not be an auspicious time to try to give raises or bonuses. However, there are other rewards that are just as valuable, whether money is short or not. Hopefully, the work itself provides significant motivation to your staff. They should also achieve their own personal goals while fulfilling the company goals. If not, look to see the underlying causes of the frustration and attempt to correct them.

In addition, job satisfaction can be increased by providing recognition of jobs well done, increasing responsibility, and making promotions.

As Equity Theory points out, you can single out people for recognition, but you should also try to find something in every member to applaud. The no bonuses or raises policy should apply to everyone, not just hourly workers.

Inviting employee participation in times of crisis is an excellent opportunity to brainstorm methods to do more with less. After all, they are the ones who are in the trenches. If they are helping by being productive, that will add to the bottom line.

Focus on sustainable projects

One way to galvanize employee enthusiasm and generate favorable publicity is to implement sustainable practices in your vineyard and/or winery.

Companies such as Grove Mill Winery (New Zealand) and Fetzer Vineyards (Hopland, CA) are leading the way toward zero waste, zero impact, and zero footprint goals for their products and organizations. This helps everyone keep busy reducing costs and making the business more sustainable — again, adding to the bottom line.

Bottom line of leadership

In real estate the mantra is location, location, location. In business, and especially in uncertain times, it is communicate, communicate, communicate — frequently, honestly, and openly. The benefits will help you weather the difficult times, and will continue as our economy recovers and prosperous times return. ■

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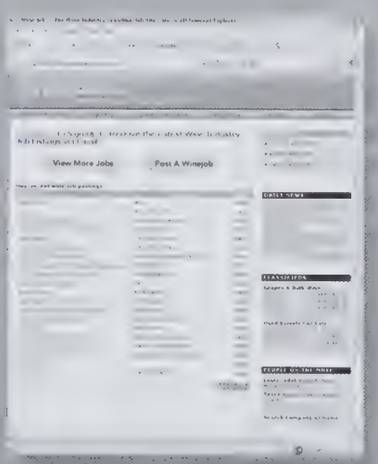

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BRILLIANT WINES

In pursuit of clarity

BY Bibiana Guerra,
Senior Technical Writer,
Dept. Of Viticulture & Enology
University of California, Davis

Protein stability tests and how to ensure that bottled wines stay brilliant are the subject of several reports below. The various types of stability tests that use heat — the tests most widely used by winemakers — are reviewed in the first report. Factors that influence bentonite fining of proteins are reviewed in the next three summaries. The last summary examines fining of tannins with gelatin.

Influence of intrinsic factors on conventional wine protein stability tests[1]

Dr. Roger Boulton (UC Davis) and his team compared three types of protein stability tests: heat test, ethanol precipitation test, and tannin precipitation test. All three tests were applied to 23 Portuguese and Austrian white wines of different vintages and the results were analyzed in 2001.

They found that the turbidity developed with the heat test — whether using a fast precipitation at higher temperature or a slow precipitation at a lower temperature — was proportional to the amount of protein in the wines. This confirms the suitability of heat tests to estimate the amount of fining agent to add in the cellar.

In contrast, both the ethanol and tannin precipitation tests showed that many wine components, such as pH, calcium, iron, potassium, and copper, interfered with test results. Since the turbidity produced in these latter methods was not necessarily proportional to the actual amount of protein in the wines, ethanol and tannin precipitation tests are less useful for a winemaker.

To learn which proteins in wine are more prone to precipitation, the authors stored the wines for one year to precipitate proteins. Then, they compared the wines' protein profiles before and after precipitation. The two profiles were similar and no given protein type tended to precipitate first. They concluded that, to achieve protein stability, it is best to remove **all** protein types.

To determine which factors contribute most to development of a wine haze, they modified wine samples to represent two **extreme** levels of each potential culprit. For example, to learn about the effect of pH, they prepared a wine sample with high pH and another one with low pH — by adding HCI — and compared precipitation patterns in the two samples. They did the same for tannin (low and high tannin), ethanol (low and high ethanol), and temperature (low and high temperature).

They found that the most important factor affecting haze formation was the difference in the concentration of tannins. They reached this conclusion because factors like pH and storage temperature affected haze formation only when tannin was added. In contrast, in the absence of added tannin, pH and storage temperature did not have any impact on haze formation.

Therefore, once they determine the ideal amount of fining agent, winemakers must make sure that tannin levels in their wines do not change (due to blending, precipitation, addition, etc).

Protein haze in bottled white wines —

How well do stability tests and bentonite fining trials predict haze formation during storage and transport?[2]

Wineries differ widely in the method used to conduct the two steps normally involved in a stability test: 1) inducing a haze, and 2) measuring the haze induced.

In 2006, K. F. Pocock and E. J. Waters (Australian Wine Research Institute) surveyed and compared three different methods of **inducing** a haze and three different methods of **measuring** a haze used by wineries in Australia.

The methods of inducing a haze that were compared included:
1) heating at 60°C, 70°C, or 80°C,
2) heating for two hours or six hours, and
3) the "Bentotest" (consists of adding increasing amounts of bentonite to test tubes of wine and then choosing the smallest amount that prevents development of a haze).

The "Bentotest" always indicated that more bentonite was needed than the two heat tests. For this reason, other researchers have recommended that winemakers base their final bentonite dosage on the tube containing a light haze, rather than the one with no haze, when using "Bentotest."

Heating at 80°C predicted larger amounts of bentonite to be used than heating at 60°C or 70°C. Heating for six hours predicted larger doses than heating for two hours.

The methods of measuring a haze that were compared included:
1) a nephelometer,
2) a spectrophotometer, and
3) visual inspection.

A nephelometer was determined to be more reliable than using a spectrophotometer. This is because the nephelometer does not pick up unwanted color changes that occur when the wine is being heated during the stability test. Visual inspection was even less desirable due to its subjectivity.

The authors compared the suitability of several bentonite fining trials in detecting hazes in eight commercial white wines after storage. To do that, they either fined each wine (with doses

based on the combined information of various heat tests) or left them unfined.

The wines were stored under "extreme" conditions, including: 1) ideal conditions (13° to 17°C for one month), 2) "commercial transport" conditions (35°C for one month), and 3) fluctuating conditions (cycles of one day at 35°C followed by one day at 20°C, repeated eight times).

When the authors used the first two conditions, all bentonite-fined wines were bright (with the exception of one Riesling), and even two unfined wines were also bright. In contrast, all bentonite-fined wines in the fluctuating regime were bright, but all unfined wines developed a haze.

How well did the conditions chosen by the authors for the fining trials work? They were successful — but maybe too successful. The authors believe that the most commonly used methods tend to over-fine wines. Using the least severe conditions — heating at 80°C for two hours, or even heating for only five minutes — would have predicted an adequate bentonite dose to keep the eight wines in this study bright, even under the harshest storage conditions.

However, the authors admit that continuing to heat at 80°C for two hours is probably the prudent thing to do. This will ensure that the sample — not just the heating apparatus — has a chance to reach the specified temperature.

Small-scale fining trials — Effect of method of addition on efficiency of bentonite fining[3]

Bench trials have the goal to determine, in the lab, the amount of a product to add in the cellar. In a 2001 study, Dr. Linda Bisson (UC Davis) and her team studied various ways in which wineries conduct bentonite bench trials.

Bentonite should always be prepared in water, as swelling is limited when the solution contains alcohol. Whether the water should be cold or warm depends on the type of bentonite, as some agglomerated bentonites disperse adequately in cold water, whereas others — like the KWK Volclay sodium bentonite used at 5% in this study — benefit from hot water.

The authors found that the turbidity generated by a given dose of bentonite was much lower if the bentonite had been mixed at high speed (Fisher Thermax, 2.5 cm stir bar, speed "1" for 15 seconds) than if it had been prepared at low speed (orbital shaker, 200 rpm for 15 seconds). In other words, mixing speed was important, and a fast rate of mixing led to the conclusion that a wine would be stabilized with a smaller amount of bentonite. This also emphasizes the importance of keeping the mixing rate the same in both the lab and the cellar.

The authors found not only a significant difference in the same samples fined by different lab personnel, but also a difference between sample replicates prepared by the same person. Bentonite age and how the bentonite was introduced into the wine had no effect on turbidity.

To minimize variations in the results of in-house fining trials, the authors recommend that wineries:

- always conduct the trials in duplicate and,
- read the appearance of the sample coming out of a haze test immediately after mixing.

Effect of bentonite treatment of grape juice on yeast fermentation[4]

In an earlier study (1994–1996), Dr. Linda Bisson and her team compared two common ways of fining with bentonite: 1) treating the juice and removing bentonite before inoculation ("treating + removing"), and 2) treating the juice and allowing the bentonite to be present throughout fermentation ("present throughout").

After fining six different white wines with both methods, they found that "treating + removing" decreased the maximum fermentation rate and increased the overall fermentation time. "Present throughout" had no effect on these parameters. This is in agreement with the common observation that clarified juices ferment more slowly.

The authors found that "treating + removing" produced wines with higher residual glucose — and particularly higher fructose — than "present throughout." Yeast tends to prefer glucose over fructose, letting the latter accumulate. The authors believed that the longer fermentations of the "treating + removing" method had a magnifying effect on the accumulation of fructose.

When the authors tried to reverse the effects of bentonite fining by supplementing the juices with the main macro- and micro-nutrients, they did not succeed. Their interpretation was that bentonite removes some neces-

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sary nutrients other than the main macro- and micro-nutrients indispensable for growth (perhaps fatty acids, phospholipids or sterols). These "mystery" nutrients seem to still be available when bentonite is left in the juice.

Bentonite fining may lead to a sluggish fermentation when the bentonite lees are removed. If this happens, the authors suggest adding fatty acids and compensating with juice aeration.

Influence of fining with different molecular weight gelatins on proanthocyanidin composition and perception of wines[5]

Understanding the interactions between fining proteins and different types of tannins may, one day, allow winemakers to perform more efficient fining and even target specific classes of tannins.

Chantal Maury (Station Oenotechnique de Champagne, Epernay, and Laboratoire de Biopolymères et Arômes, Montpellier, France) and other researchers compared the type of tannins being fined out of a wine when using a large-size or a small-size gelatin (16 kilodaltons and 190 kilodaltons, respectively). They also tried a mix of the two, commercially known as "Gelisol."

The two types of gelatins (large and small) precipitated approximately the same amount of tannins (10%), whereas "gelisol" precipitated more tannin (16%). The results confirm that gelatins do not precipitate monomeric phenols — only polymeric phenols — and do not affect color.

In their study, the small gelatin removed larger tannins than the larger gelatins did. "Gelisol" behaved somewhere in between. When they compared the tannin profile of the fined wines against the corresponding profiles of unfined wines, they noticed that there were almost no differences between the two when the large gelatin was used.

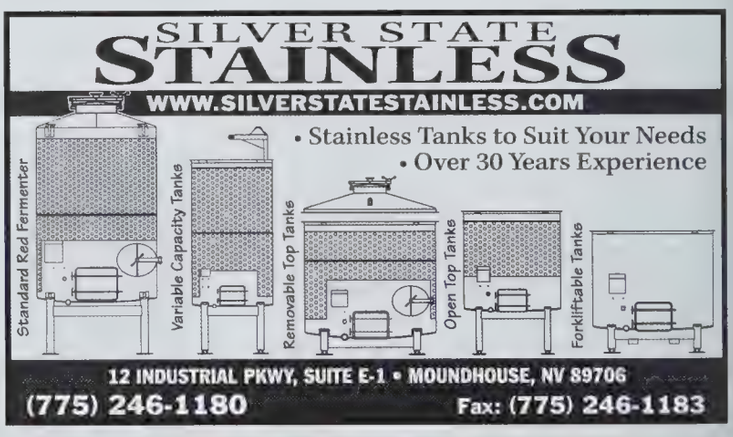
In other words, the high molecular weight gelatin was ineffective in reducing tannin content. The authors attribute this to the lack of "flexibility" of a large molecule compared to a small one, which renders the large molecule less able to bend and reach the reaction centers in a tannin molecule.

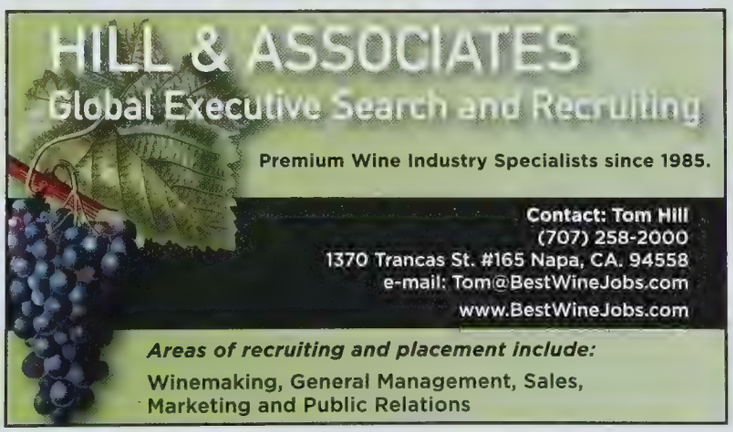
Using a panel of 12 judges, the authors compared how the wines tasted after fining with either type of gelatin. With the first of the Syrah/ Grenache wine blends tasted, they could not notice any difference. With the second wine tasted, they found that the wine treated with the smaller gelatin was less astringent than the same wine treated with the larger gelatin.

In summary, not only was the small gelatin able to remove larger tannins, but previous studies have shown that the larger tannins are precisely the most astringent (contribute more to perceived astringency than smaller tannins). ■

This article is part of a series sponsored by the UC Davis Department of Viticulture & Enology to make research more accessible. For individual summaries of these and other articles, go to http://wineserver.ucdavis.edu and click on Trellis Alliance, then Research summaries.

References on page 76

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Brilliant wines

Continued from page 74

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Bibiana Guerra, PhD, worked at Woodbridge by Robert Mondavi as a research winemaker and a grower educator for seven vintages. Before that, she worked at Flowers Vineyards & Winery (Cazadero, CA), first as an assistant winemaker (1998), then as vineyard manager (1999). She is currently a technical writer in the Department of Viticulture & Enology at UC Davis.

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June 23–26
ASEV 60th Annual Meeting
Marriott Napa Valley Hotel and The Meritage Resort
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ASEV will celebrate its 60th Annual Meeting by debuting new venues in Napa Valley, CA.

Special Events

High Brix Winemaking Symposium. June 23, 8AM–5PM, Meritage Resort. Speakers: Andy Beckstoffer, Beckstoffer Vineyards, CA; Linda Bisson, UC Davis; Roger Boulton, UC Davis; Christian Butzke, Purdue University, (IN); Ulrich Fischer, Abt. Weinbau und Oenologie DLR Rheinpfalz, Germany; Jim Harbertson, Washington State Univ. (WSU), Prosser; Markus Keller, WSU, Prosser; Richard Sowalsky, Hill & Wollack Wine Estates, CA. Brix adjustment continues to have great interest — Symposium speakers will provide current winemaking applications and a scientific understanding of alternative winemaking practices with high sugar concentrations that may result in problematic fermentation, and share varied experiences. Wine tasting included.

Rootstock Symposium, Rootstock Characteristics and Implications for Selection. June 23, 8AM–5PM, Marriott Napa Valley Hotel.

Speakers: Larry Bettiga, UC Cooperative Extension, Monterey County; Peter Cousins, USDA, NY; Nathalie Ollat, INRA Bordeaux, France; Dawid Saayman, Distell, South Africa; Rhonda Smith, UC Cooperative Extension, Sonoma County, Andrew Walker, UC Davis; Rob Walker, CSIRO, Australia; James Wolpert, UC Davis. This program will be anchored with several speakers including Andrew Walker, with his vast knowledge of the wild Vitis species. International perspectives will be included from Europe and the southern hemisphere. Presentations will highlight data from university research projects. A grower panel will provide commentary on approaches for selection of rootstocks for new vineyard projects. James Wolpert will present a summary of his rootstock research and others since the discovery of biotype B *phylloxera* 20 years ago.

International Cabernet Symposium. June 26, 9AM–5PM, Meritage Resort. A trans-Atlantic discussion between viticulturists and enologists about growing, crafting, and ageing the world's finest Cabernets. Speakers will represent wine growers and wine scientists from the U.S. West Coast, and Bordeaux. A joint roundtable discussion will be followed by a tasting hosted by Cabernet vintners from various appellations. Speakers: Frederick Ammons, The Napa Valley Reserve, CA; Xavier Choné, Terroir Consultant, France; Paul Draper, Ridge Vineyards, CA; Gregory Jones, Southern Oregon University, Ashland; Tod Mostero, Dominus Estate, CA; Tony Soter, Soter Vineyards, OR; Kees van Leeuwen, Château Cheval Blanc, France. Lunch Speaker: George Taber, *Time Magazine* Correspondent Emeritus, New York (Author of *Judgment of Paris*).

Research Reports, oral sessions, enology and viticulture research colloquia, poster sessions, wine reception, and winery dinners will occur June 24–25.

Supplier-Industry Seminars. June 24–25, include cellar sanitation (to be offered once in English and once in Spanish), lab practices, oak alternatives, sprayers in the vineyard (on-site in vineyard), and winery construction.

For more information and to register, go to: www.asev.org or call 530-753-3142.

Long, Walker to receive ASEV top honors

American Society for Enology & Viticulture (ASEV) will present its two highest honors, the Merit Award and Honorary Research Lecturer, to Zelma Long on June 25, and Dr. Andrew Walker on June 24 respectively, at the Society's 60th Annual Meeting.

Zelma Long was the first woman in the industry to run both the winemaking and business side of a major winery, leading Simi Winery to prominence as its winemaker/vice president, president, and CEO in the 1980s and 1990s. Today, she is the owner and winemaking partner with her husband, Philip Freese, of Vilafonte (Wine Estate) in South Africa and owner / winemaker of Long Vineyards in California's Napa Valley. Long has received national and international awards for her leadership positions that have included: founding president of the American Vineyard Foundation, chair of the American Viticultural and Enology Research Network (AVERN), founding president of the Alexander Valley Winegrowers, founding member of the North Coast Viticultural Research Group, ASEV Board director, and member of the local Board of the International Women's Forum.

Dr. Andrew Walker of the University of California, Davis, will present the Honorary Research Lecture on June 24. A grape breeder/geneticist in the Department of Viticulture and Enology since 1989, Dr. Walker has developed new rootstocks with resistance to fanleaf degeneration, nematode complexes, *phylloxera*, and salinity tolerance. He is currently involved in breeding wine, raisin, and table grape resistance to Pierce's disease and powdery mildew. Dr. Walker has served as chair of the Horticulture and Agronomy Graduate

Group since 1997, which oversees Master of Science and doctorate degrees in viticulture. He has served as vice chair of the Department of Viticulture and Enology (2005–2008), Secretary-Treasurer for ASEV (1999–2004), and is an Associate Editor for the *American Journal of Enology & Viticulture*. He is Chair of the National Grape Crop Germplasm Committee, which advises the U.S. Department of Agriculture and represents grape germplasm interests! at the national level. He was awarded the Louis P. Martini Endowed Chair in Viticulture in 2001.

July 16–17
Wine Industry Technical Symposium
Napa Valley Marriott Hotel & Spa, Napa, CA

July 16

1PM: Attendee registration and technology showcase

2:30PM: Basic technology workshops, including: Basics of web 2.0 technologies; Consumer compliance, next generations of issues; New developments in winery compliance technologies.

5:15PM: Technology showcase and welcome wine reception

6:45PM: VIP networking dinner

July 17

8AM: Attendee registration, technology showcase, and networking continental breakfast

9AM: General Session Topics: Social media, the leading edge; Social commerce panel; Wine retailer leadership lessons; Distributor technology panel.

12:15PM: Networking seated lunch and technology showcase

2:15PM: Breakout Session #1 (four Tracks) — Track A: Business intelligence best practices; Track B: DTC metrics, benchmarking and best practices; Track C: Cracking the code at Wal-Mart; Track D: Blend management: advances in tank farm computing.

3:45PM: Breakout Session #2 (four Tracks) — Track A: Advances in Cloud Computing; Track B: Leveraging social media into direct sales successes; Track C: Advances in sales force automation; Track D: Vineyard Data Management: Advances in handheld technologies in vineyards

5PM: Technology Showcase and wine reception

For more information and to register, visit www.wineindustrytechnologysymposium.com/.

July 20–22
2009 ASEV/Eastern Section Annual Conference
Winegrowing for the 21st Century; Dealing with the stresses of a changing climate
Renaissance Quail Hollow Resort, Painesville, OH

The Conference will focus on methods to help winemakers and grape growers deal with both the problems and opportunities beginning to evolve as the climate changes. The program will offer a tour of several wineries in the Lake Erie region, guided by Ohio State University wine and grape specialists, and presentations on current research at various eastern university enology and viticulture programs. A student research paper competition, social events and banquets featuring Ohio wines, scholarship presentations and special awards will be included. The attendees, a diverse mix of educators, commercial wine growers, extension specialists and new enterpreneurs, offer a unique opportunity to network in this growing industry. **Information available on the web** at www.nysaes.cornell.edu/fst/asev, or contact Tim Martinson at tem2@cornell.edu or Keith Streigler at strieglerk@missouri.edu.

July 22
Owning and Operating a Winery or Brewery
Portland, OR

Seminars include: Licensing and permitting a winery or brewery; Labor and employment issues in the alcohol industry; Distribution and shipping updates — risks and risk avoidance in the alcohol industry; Trademarks — what you need to know about intellectual property protection; Environmental law; Public relations and sales; Contract brewing and winemaking; Spirits — the next step.

For more information and to register, call 800-574-4852, E-mail: Info@TheSeminarGroup.net, or go to http://www.TheSeminarGroup.net/.

July 27–29
Principles of Soil Fertility: Understanding Soil Tests and Nutrient Relationships
Holiday Inn Express, St. Louis, MO
Program: 8AM to 5PM each day

Kinsey Agricultural Services presents topics including soil tests and their use, building soil life, liming and pH, N-P-K needs and materials, sulfur, trace elements, and compaction.

Cost: $650 per person, includes lodging (Sunday through Tuesday night with breakfast), plus lunch each day. Dinners not included.

Optional Tours (Register by June 26 to assure lodging, tour seat / lunch): Thursday, July 30, All-day tour to farms using the program in southeast Missouri. Cost: $125/person includes Wednesday night motel room, transportation, and lunch Thursday. Friday, July 31: Soil Test Lab Tour and lunch on Friday. Cost: $125/person includes Thursday night lodging, transportation to lab. Arrive back to motel by 2:30 PM.

For information, course registration, and motel reservations call 573-683-3880, or see the Courses & Meetings page at www.kinseyag.com.

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PRACTICAL WINERY & VINEYARD
SUPPLIER SHOWCASE
MAY/JUNE 2009

Winemaking Supplies

Enzymes

American Tartaric Products . 84
Beverage Supply Group 79
DSM Food Specialties 79
Gusmer Enterprises 81
Laffort Oenologie 82
Lallemand, Inc. 84
Maurivin Yeast 7
Napa Fermentation Supplies . 86
Scott Laboratories 80
Vinquiry 81
Vintner's Supply Co. 87

Malolactic Cultures

Beverage Supply Group 79
Gusmer Enterprises 81
Lallemand, Inc. 84
Napa Fermentation Supplies .86
Scott Laboratories 80
Vinquiry 81

Barrel Alternatives

Demptos Napa Cooperage . .87
Nadalie USA 84
Oak Solutions Group 79
Pickering Winery Supply 86
Pronektar by Radoux 80
StaVin, Inc. 82

Yeast

American Tartaric Products .84
Begerow USA 82
DSM Food Specialties 79
Gusmer Enterprises 81
Laffort Oenologie 82
Lallemand, Inc. 84
Maurivin Yeast 85
Napa Fermentation Supplies .86
Scott Laboratories 80
Vinquiry 81
Vintner's Supply Co. 87

Micro-Oxygenation

American Tartaric Products . .84
StaVin, Inc. 82

Quality Control — Lab Equipment & Supplies

Atago USA, Inc. 91
Hanna Instruments 81
Napa Fermentation Supplies .86
Nomacorc/Presense 87
St. Patrick's of Texas 85
Scott Laboratories 80
Vinquiry 81

Yeast Nutrients

Begerow USA 82
Beverage Supply Group 79
DSM Food Specialties 79
Gusmer Enterprises 81
Laffort Oenologie 82
Lallemand, Inc. 84
Maurivin Yeast 85
Napa Fermentation Supplies .86
Scott Laboratories 80
Vinquiry 81
Vintner's Supply Co. 87

Fining Agents

DSM Food Specialties 79
Laffort Oenologie 82
Scott Laboratories 80
Vinquiry 81
Vintner's Supply Co. 87

Filter Media

Koch Membrane Systems . . .80
Napa Fermentation Supplies . 86
Pall Corp. North America . . .85
St. Patrick's of Texas 85
Scott Laboratories 80
Vintner's Supply Co. 87

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Beverage Supply Group

Beverage Supply Group (BSG) is a division of Brewers Supply Group, a well-established company delivering products and technical support services to the brewing industry for over 150 years. Strategically located across the U.S., BSG is pleased to offer proven products to the wine industry with the same dedication to service and support that has won the allegiance of brewing counterparts.

Beverage Supply Group

Known for an outstanding range of yeast and MLF nutrients, BSG offers in-depth assistance with all aspects of fermentation nutrition. **Superfood**®, the "gold standard" of nutrient blends, plus all other unique supplement blends developed by Lisa Van de Water (Vitamix®, Supervit®, Leucofood™ etc.) comes with personalized technical support.

A new line of very promising **Vintagezym** enzymes from Kerry, was introduced in 2007. The results of color stabilization, increased mouthfeel, aroma enhancement, and the softening of harsh tannins, are exceptional with several of these products. Trial samples are available.

The extremely cost-effective and efficient frozen MLF bacteria **Oenos**® (Oeno cups), has been well received and provides a much-needed alternative to costly, direct-addition formulas.

A new solution to oak alternatives — **Oak Infusion Spirals** — has been well received. More information is available from your sales representative.

Most products and technical support information are available online at www.BSGwine.com.

For more information, contact:
Beverage Supply Group
403 Gateway Rd West, Napa, CA 94558
tel: 800/585-5562
e-mail: sbrent@rahr.com
website: www.bsgwine.com

PLEASE SEE BEVERAGE SUPPLY GROUP AD, PAGE 47.

DSM Food Specialties

DSM Food Specialties (DSM) is a leading manufacturer and supplier of yeast, yeast-derived products, and enzymes — brands such as Fermivin, Fermicru, Collection Cépage, Rapidase, and the new Claristar (specific mannoproteins for tartrate stabilization). Developed by winemaking experts with leading enological universities and institutes, a complete range of specially designed wine biotechnology ingredients is available for selected enological applications.

For bulk to super-premium wines, DSM's enzymes, wine yeasts, and fermentation aids provide solutions tailored to any winemaking style.

DSM has identified synergies between key products in its portfolio of winemaking ingredients and offers ingredient combinations which, when used together, interact to enhance or magnify one or more effects, or create new beneficial effects. The results obtained through these synergies are superior to that of using each product alone.

Unlimited. DSM

The sequential action of DSM Rapidase® Maxifruit enzyme and Fermicru® XL yeast allows for production of fruitier red wines with enhanced mouthfeel and improved color stability. For white wines with thiol precursors, new Rapidase Expression works particularly well in synergy with Collection Cépage Sauvignon yeast for a green varietal character. When combined with Fermicru 4F9, the synergy delivers a fruitier, more tropical profile.

An effective solution to a stuck or sluggish fermentation is DSM's fructophilic yeast, Fermichamp®, and highly adsorbant, low-odor detoxifying yeast hull Extraferm®; used together, these ingredients enable a fresh fermentation start until dryness.

For more information, contact:
DSM Food Specialties USA, Inc.
Marsha Cummings
45 Waterview Blvd., Parsippany, NJ 07054
tel: 704/854-5310; fax: 704/854-5312
e-mail: Marsha.Cummings@dsm.com
websites: www.dsm-foodspecialties.com
www.dsm-oenology.com

PLEASE SEE DSM FOOD SPECIALTIES AD, PAGE 63.

Oak Solutions Group

ēnoCUBES by ēvOAK are a masterful combination of carefully chosen oak cubes that are blended to bring out the best in each enological state. ēnoCUBES are unique flavor blends created from uncompromising oak selection and carefully monitored toasting.

White and Red Fermentation Blends are specifically designed to add structure and lift the fruit characters. These blends improve body by adding volume, which enhances the fruit component. The lightly toasted oak in these blends adds oak tannins, protecting the wine from oxidation.

ēnoCUBES

Aging Blends work with the evolution of wine over a longer period of time, creating an intricate balance that helps the wine develop naturally without overshadowing fruit character. Blends are available in White Traditional, White New World, and Red.

White and Red Finishing Blends are highly extractive, adding intense character to wine. Elements accentuate fruit character, and add impact to push the wine's flavor into bold levels.

Winemakers can depend on one or seven ēnoCUBE blends that are both unique and unforgettable to help them craft wines through the enological process.

These new releases can be tasted through ēnoCUBE bench-trial sample kits.

For more information, contact:
Oak Solutions Group
Paul Abbott, Oak Solutions Specialist
2557 Napa Valley Corporate Dr., Suite D
Napa, CA 94558
tel: 707/259-5988; fax: 707/255-5952
e-mail: pabbott@oaksolutionsgroup.com
website: www.oaksolutionsgroup.com
Kyle Sullivan, Oak Solutions Specialist
tel: 707/287-8555; fax: 707/255-5952
e-mail: ksullivan@oaksolutionsgroup.com

PLEASE SEE OAK SOLUTIONS GROUP AD, PAGE 41.

Scott Laboratories, Inc.

In 2009, Scott Labs expands its listing of certified organic products (OMRI). In addition to previously certified Laffort Dynastart, Lallemand's Fortiferm, Opti-Red and Opti-White have been certified for use in organic winemaking.

Scott Labs also introduces new products, such as Laffort Bioarom. It is the result of extensive research on wine aromas and their protection during lees aging. The result is to improve a wine's natural resistance to oxidation and to protect aromas and flavors.

Laffort Biolees Instant is a result of extensive research on lees aging. It contains yeast cell compounds and specific hydrolysed polysaccharides to provide a perception of sweetness and an enhanced mouthfeel. While similar to Biolees, Biolees Instant has a soluble formulation that dissolves immediately.

Laffort Quertanin Intense is a high-quality ellagic tannin extracted from toasted French oak. It amplifies mouthfeel together with aromas of toasted oak, almond, and coffee. Quertanin Intense helps develop the overall complexity of the wine and also has a slight anti-oxidant effect.

Laffort Tanin VR Color is composed of natural catechin tannin that has been specifically formulated for use during red wine fermentation. Its unique reactivity provides a bridge between free anthocyanins and acetaldehyde. The result is to stimulate chemically-stable covalent bonding between specific tannins and anthocyanin molecules. In your red wine this means superior color stability.

New quantities include: Lallemand yeasts BM4x4 (10 kg) and BRL97 (10 kg), and Lallemand malolactic bacteria 1-Step VP-41 (100 hL).

For more information, please contact:
Scott Laboratories, Inc.
PO Box 4559, Petaluma, CA 94955
tel: 707/765-6666; fax: 707/765-6674
e-mail: info@scottlab.com
website: www.scottlab.com

PLEASE SEE SCOTT LABS AD, PAGE 34.

Pronektar

Pronektar is a complete line of oak alternative products from Tonnellerie Radoux.

Pronektar oak alternatives are made from the same oaks that Radoux uses to make its fine oak wine barrels. All of the wood is aged and then convection-toasted to exacting specifications. Available in both French and American oak, Pronektar's products are divided into two categories: oak used for fermentation, which includes powder and granulate; and oak used in aging, which includes chips, staves, segments and stick sets.

PRONEKTAR
The fruit of the wood

Fermentation oak products are becoming a very popular way to improve the quality of any wine. The use of powder or granulates during fermentation, pressing them out before aging, can reduce vegetal characteristics, set color, reduce oxidation, and prepare the wine for further oak aging.

Wineries using Pronektar are getting the same quality of wood that is aged in the same way as Radoux barrels. The convection toasting method ensures consistency and quality in every product.

For more information contact:
Radoux USA
Martin McCarthy
480 Aviation Blvd., Santa Rosa, CA 95403
tel: 707/284-2888; fax: 707/284-2894
e-mail: mmccarthy@radoux-usa.com
website: www.radouxcooperage.com

Koch Membrane Systems, Inc.

New from Koch Membrane Systems, Inc. (KMS) is the model WF-12 hollow fiber crossflow microfiltration (CMF) system designed specifically for use in wine clarification. This 12-cartridge system employs a new membrane that is sturdier and more productive than other membranes, and will process wine at up to 68 hl/hr.

With KMS crossflow filtration, a feed stream flows parallel to the membrane surface at high velocity, as compared to the perpendicular flow path employed in conventional depth filtration. By keeping suspended material from settling, crossflow filtration minimizes the build-up of solids on the membrane, delivering a high permeation rate, and maintaining stable throughput. CMF can be employed as a one-step process, eliminating the need for multiple diatomaceous earth filtration steps.

KOCH
MEMBRANE SYSTEMS

KMS systems are flexible, efficient, and gentle on wine due to minimal oxygen pickup and heating. The WF-12 is a fully automated system requiring little or no operator attention. Also available from KMS is the WF-6 which is either automatically or manually operated for flows up to 45 hl/hr, and the manually operated WF-3 which can process up to 27 hl/hr.

For more information, contact:
Koch Membrane Systems, Inc.
850 Main St., Wilmington, MA 01887
tel: 888/677-5624; fax: 978/694-7020
e-mail: info@kochmembrane.com
website: www.kochmembrane.com

PLEASE SEE KOCH MEMBRANE SYSTEMS AD, PAGE 99.

Vinquiry, Inc.

Enartis has partnered with Vinquiry to offer the highest quality fermentation products to winemakers in North America. A large supply of laboratory equipment and chemicals necessary for harvest are also available at Vinquiry and Enartis offices. The following are some of the newest products for the 2009 harvest.

Yeast by Enartis have been selected for properties that enhance sensory characteristics of grape varieties around the world. Some strains are: Challenge Vintage White, Challenge Red Fruit, and Challenge EZFerm.

Nutrients and Fermentation Aids: The use of nutrients helps yeast overcome difficult fermentation conditions, and compensates for nutrient deficiencies in juice and must. Enartis has developed a wide range of yeast nutrients of various compositions to facilitate a consistent and complete fermentation. Enartis nutrients and fermentation aids include Nutriferm Advance and Nutriferm Energy.

Vintessential Enzymatic Test Kits for the analysis of acetic acid, amino acid nitrogen, ammonia, glucose + fructose, and L-malic acid are available through Vinquiry. These kits include the reagents needed to run 30 or 100 tests by spectrophotometer.

For more information, contact:
Vinquiry, Inc.
7795 Bell Rd., Windsor, CA, 95492
tel: 707/838-6312; fax: 707/838-1765
e-mail: info@vinquiry.com
website: www.vinquiry.com
Napa Office: 2025 Redwood Rd. Ste. 9
tel: 707/259-0740
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Santa Maria, CA 93455
tel: 805/922-6321
Paso Robles Office:
6305 Buena Vista Dr. Ste. 102
Paso Robles, CA 93446
tel: 805/591-3321

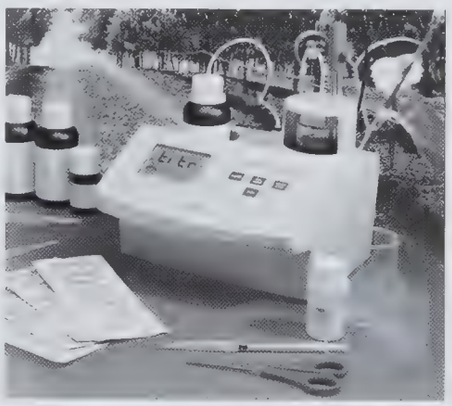
PLEASE SEE VINQUIRY AD, PAGE 64.

Hanna Instruments

Hanna Instruments offers the HI-84100 mini-Titrator for determination of free and total sulfur dioxide for wine analysis. The HI-84100 is a low-cost, easy-to-use, microprocessor-based automatic titrator that benefits from Hanna's years of experience as a manufacturer of analytical instruments.

The HI-84100 has a simple and reliable peristaltic pump to ensure accurate dosing and repeatability. By performing pump calibration with the provided Hanna standards, instrument accuracy is assured.

This instrument is supplied with a preprogrammed analysis method designed for free and total sulfur dioxide measurements on wine samples. The instrument features a powerful and effective built-in algorithm to analyze the shape of the electrode response curve and to determine the reaction completion. This algorithm automates the analysis and makes all necessary calculations.



The interface of the HI-84100 is clean and simple. By simply pressing the START/STOP button, the instrument will automatically make the titration up to the equivalence point. The result is immediately displayed in convenient units; then the instrument is ready for another titration. The Hanna HI-84100 offers the possibility to quickly and accurately test free or total SO_2 in all wines (including red).

For more information, contact:
Hanna Instruments
584 Park East Dr., Woonsocket, RI 02895
tel: 800/426-6287; fax: 401/765-7575
e-mail: wine-brew@hannainst.com
website: www.hannainst.com/USA

Gusmer Enterprises

Gusmer Enterprises, Inc. offers the OenoFoss™ from FOSS, a compact, easy-to-use analytical instrument for grape must, fermenting juice, and wine, providing up to seven quality control tests from two drops of sample. Gusmer can perform an OenoFoss™ demonstration onsite at any winery.

FOSS developed the OenoFoss™ specifically for small to medium size wineries. The OenoFoss™ is built on the same FTIR technology as the larger WineScan™ unit. Many wine producers and laboratories in the wine industry have used OenoFoss™ and Winecan™ FOSS instruments to deliver rapid and accurate results that winemakers require.

Two drops and two minutes is all it takes to measure glucose/fructose, pH, TA, VA, malic acid, alcohol, and color. The OenoFoss™ is simple to use, fast, economical, and doesn't require lab reagents. The OenoFoss™ is portable and robust, allowing the instrument to be used in locations around the winery or off site.

Gusmer offers a full range of bacteria, yeast, nutrients, filter media, fining agents, enzymes, oak alternatives, lab supplies, and more. Learn more at www.gusmerenterprises.com.

For more information contact:
Gusmer Enterprises
81 M St., Fresno, CA 93721
tel: 559/485-2692; fax: 559/485-4254
e-mail: sales@gusmerenterprises.com
website: www.gusmerwine.com

PLEASE SEE GUSMER ENTERPRISES AD, PAGE 67

LAFFORT USA, INC.

Laffort selects and manufactures a broad range of enological products worldwide, including yeast, bacteria, nutrients, tannins, enzymes, fining agents, and stabilizing agents.

Laffort's product, **BIOLEES**, is a peptide and the purified active agent in lees aging, producing a double effect of sweetening and giving roundness to a wine. **BIOLEES**, a yeast cell hull-based product, also produces a fining effect. The new formula **BIOLEES INSTANT** is concentrated with a peptide fraction that brings sweetness when released to wine during lees aging, and contains specific hydrolyzed polysaccharides giving the perception of roundness in the wine.

LAFFORT

Quertanin Sweet and **Quertanin intense** are new ellagic finishing tannins extracted from oak heartwood. Both products use Laffort's Instant Dissolving Process (IDP). **Quertanin Sweet** develops the perception of sweetness while contributing to coconut and vanilla notes to a wine. **Quertanin Intense** amplifies mouthfeel together with toasting characteristics (almonds, coffee).

Laffort's new **Zymaflore FX10** yeast strain specifically suits Bordeaux varieties. Made by a breeding technique, it is extremely robust in fermentation, and very neutral aromatically, for fruit expression. It enhances a softer mouthfeel by liberating high quantities of polysaccharides, rounding harsh tannins. Its ability to mask "greener" aromas has also been noticed.

Laffort Research offers **Tanin VR Color**, a fermentation catechin tannin dedicated to color stabilization. Proprietary Oxyprotect™ production prevents the tannin preparation from oxidation, and renders it highly reactive with anthocyanins.

For more information, contact:
Laffort USA, Inc.
tel: 415/613-0609
e-mail: charlotte.gourraud@laffort.com
website: www.laffort.com

PLEASE SEE LAFFORT ADS, PAGES 7, 9.

BEGEROW USA, INC.

Begerow GmbH & Co. supplies liquid filtration with years of experience, technical expertise, and a global network of subsidiary and partner companies making Begerow a leading manufacturer in this field, with particular focus on the food and beverage industries.

BEGEROW

Begerow offers a variety of high-quality products for wine, fruit juice, and spirit production, ranging from yeast products to complete, fully automatic filtration systems. Enological products, such as a variety of pure yeast solutions for wine processing, play an important role in Begerow's wide product range.

Begerow offers the new SIHA OakArome wood chips with different degrees of toasting as a stylistic tool.

The company places great importance on providing cooperative service and competent advice, down to the last detail.

As the only single-source provider, Begerow offers innovative, customer-oriented, high-quality systems. Begerow regularly undergoes audits by external specialists and independent institutes in order to continuously improve quality standards. Begerow stands for safety and reliability, and can guarantee top quality to customers.

Core competencies:

- Depth filter sheets
- Stacked disc cartridges and capsules
- Filter cartridges
- Housings and systems
- Filter aids
- Beverage treatment media (SIHA range)

For more information, contact:
Begerow USA, Inc.
Bob Spadafora
tel: 703/673-1160
e-mail: bob.spadafora@begerow.com
website: www.begerow.com

STAVIN INCORPORATED

StaVin is evolving the process of oak selection and usage. StaVin's Ph. D. scientists have developed a method for winemakers to rapidly evaluate the sensory effects of its three-year seasoned/fire-toasted oak in their wines.

These customization trials allow winemakers to assess the suitability of StaVin toast levels and oak origins for their wines. Furthermore, these samples can be blended to give an indication of sensory effects arising from oak blends and oak concentration.

This process enables a winemaker to make the appropriate oak choice for a wine based on their sensory evaluation of resultant wine quality. StaVin uses this winemaking approach to oak selection rather than a marketing approach.

For more information, contact:
StaVin Incorporated
Alan Sullivan, Steve Sullivan, Dr. Jeff McCord, Dr. Jeff Murrell, Jamie Zank
PO Box 1693, Sausalito, CA 94966
tel: 415/331-7849; fax: 415/331-0516
e-mail: info@stavin.com
website: www.stavin.com

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193pp—$55

Monographs in Cool Climate Viticulture I: Pruning and Training
David Jackson, Lincoln University, New Zealand
New approaches to analysis and interpretation of pruning and training that apply to specific benefits and challenges of cool climates.
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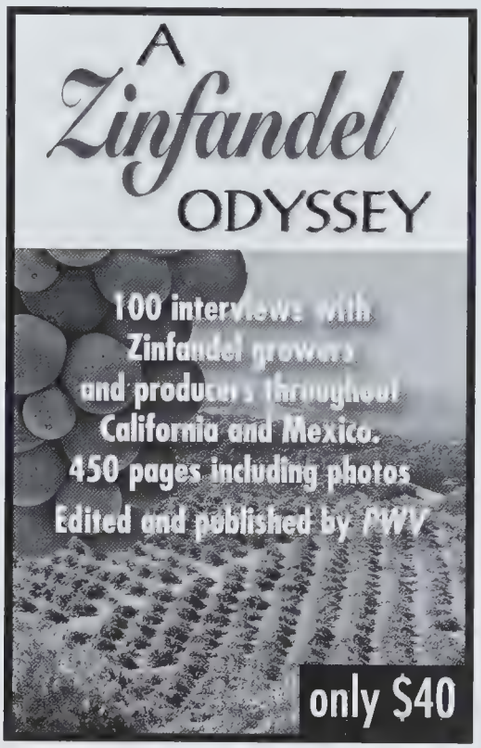
Monographs in Cool Climate Viticulture II: Climate
David Jackson, Lincoln University, New Zealand
Importance of climate for growing grapes and producing wine in cool temperatures, and how growers can avoid potential problems. Topics include world climates and global warming, vineyard establishment in cool climates, and wine styles. **80pp—$35**

Diseases and Pests
Nicholas, Margarey, Watchel
Dept. of Primary Industries & Resources, South Australia. **106pp—$40**

Diseases, Pests, & Grape Disorders Field Guide
Magarey, MacGregor, Wachtel, & Kelly
Sturdy, laminated, pocket-sized guide containing more than 350 color photos with short, easily-read descriptions of most diseases, pests, and disorders found in vineyards. **107pp—$30**



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125 color photographs showing over 30 different species of yeast, bacteria and mold commonly found in wines, as well as frequently encountered sediments.
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L. Thach, J. Olsen, & Paul Wagner
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Scott Laboratories is the sole distributor of Lallemand's enological products in North America. Shirley Molinari, formerly of Vinquiry Inc., has joined Lallemand to support the Enoferm line of products.

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Maurivin/Mauriferm

Maurivin and the Australian Wine Research Institute (AWRI) have developed three new wine yeasts (Maurivin Platinum, Maurivin Distinction, and Maurivin Advantage) that produce undetectable levels of hydrogen sulfide.

"Our objective in this research was to eliminate reductive characters in winemaking," says Dr. Anthony Heinrich, Maurivin global business manager. "We believe this is a landmark development."

These yeast strains have a non-functional sulfite reductase enzyme, which means the yeasts cannot make any detectable hydrogen sulfide, even when fermenting juice with low nitrogen content. Each has been trialed extensively under laboratory conditions using different grape juice varieties and without nitrogen supplementation. The resulting fermentations produced low levels of hydrogen sulfide undetectable to human senses and also exhibited strong fermentation properties without use of copper.

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Maurivin's new innovative range of "Next Generation" wine yeasts includes the latest in hybrid yeasts: AWRI 1503 and AWRI Fusion, non-GMO stable hybrid yeasts combining the strong fermentation capacity and ease-of-use properties of Maurivin PDM, with greater mouthfeel and increased complexity similar to that of indigenous yeast.

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c/o Pacific Coast Chemicals
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Pall Food and Beverage

Pall Corporation is now offering the XL-M system; the latest addition to the Oenoflow™ family of cross-flow filtration systems.

Designed specifically for small wineries, the hollow fiber XL-M system enables post-fermentation removal of contaminants in a reliable, reproducible, and single-process step. Clarification is achieved without the need for filter aids, centrifugation, or interference with the chemical, physical, and organoleptic characteristics of wine.

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Oenoflow systems have provided a cost saving and technical solution at more than 600 wineries worldwide. With the introduction of the XL-M system, wineries of all sizes can reduce their operating costs and increase production yield while maintaining absolute respect for the traditional properties of wine.

For more information. contact:

Pall Food and Beverage
Nicole Madrid
tel: 516/801-9137; fax: 516/625-3610
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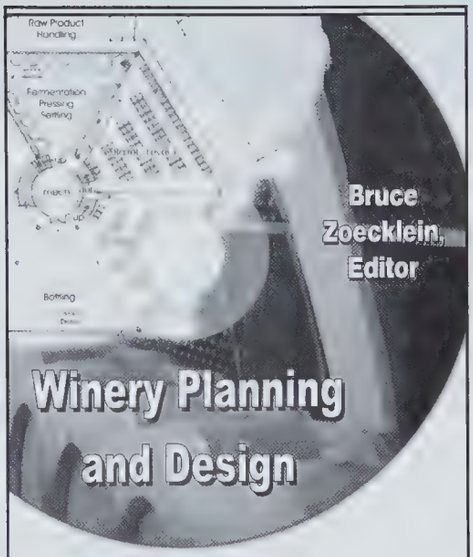

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The CD is exclusively available from PWV Bookshelf for $110.

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Napa Fermentation offers Lalvin fermentation supplies, including 23 strains of wine yeast and enzyme products. Malolactic bacteria include: Chr. Hansen Viniflora Oenos, Chr. Hansen CH 16, and Chr. Hansen CH35. Yeast nutrients include Fermaid K and Super Food.

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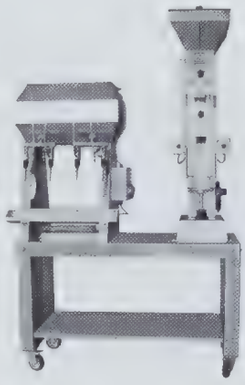

Napa Fermentation carries the Tivoli corking/filling machine (AISI-304 stainless steel), with four jaws for use with synthetic or natural corks with 22, 24, or 26mm diameter. Stainless steel fittings, and Karcher hot and cold pressure-washers are available.

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PLEASE SEE NAPA FERMENTATION AD, PAGE 64.

Pickering Winery Supply

Pickering Winery Supply (PWS) distributes oak adjuncts from Suber-Lefort of Adelaide, Australia, which has 18 years' experience in turning French barrel-quality oak into tank planks, barrel inserts, mini-staves, chips, flakes, and powder. It is the seasoning and toasting regimens of the oak that result in flavor profiles quite distinct from any others.

Suber-Lefort works with many wineries to develop specialized flavor profiles to match the wine style they wish to produce. Yellowtail, the most popular Australian brand in America, buys almost exclusively from Suber-Lefort.

PWS distributes a special fining agent produced in Germany, Vinpur Special, based on casein. It offers a gentle way to remove astringency, brown pigments, and oxidized phenols in red and white wines. What makes it unique is that it uses cellulose as a carrier, giving the casein a larger surface area and making it disperse much more completely. The result is a powder that can be directly added to a wine and is very predictable, unlike regular casein. Many wineries now consider Vinpur Special an integral part of their winemaking.

For more information, contact:
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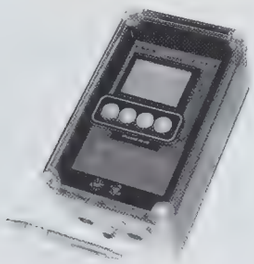
e-mail: info@winerystuff.com
website: www.winerystuff.com

PLEASE SEE PICKERING WINERY SUPPLY AD, PAGE 65.

NOMACORC/PRESENS

Synthetic wine closure manufacturer Nomacorc announces an alliance with PreSens Precision Sensing, a manufacturer of optical chemical sensors, to market PreSens oxygen measurement equipment for use in the wine industry, and to co-develop additional products.

The PreSens Fibox series of analyzers allow for noninvasive measurement of total package O_2 concentration using proprietary photo-luminescent technology, with small sensors that can be used in most bottling conditions. These accurate sensors can be used to measure both dissolved O_2 in wine, and headspace O_2 in a bottle.



"The ability to provide state-of-the-art tools for precisely measuring oxygen during bottling is the next logical step in our commitment to partnering with the wine industry to manage oxygen's impact on wine quality," says Dr. Olav Aagaard, global director of oxygen management business for Nomacorc.

Customer Jacques Beauclair (Clermont-l'Hérault France) said of the PreSens Fibox, "We believe that using the PreSens oxygen-measuring equipment will allow us to demonstrate to our customers our ability to bottle their wines under optimum conditions."

The effort will be supported by Nomacorc's enology team, which is based at Nomacorc's Center of Oxygen Management Research in Avignon, France. In addition to the alliance with PreSens, Nomacorc is a founding member of the O2inWines association and a leader in post-bottling oxygen management research with wine research institutes worldwide.

For more information, contact:
Nomacorc
Dr. Olav Aagaard
tel: 919/601-7455
e-mail: oaagaard@nomacorc.com

VINTNERS SUPPLY COMPANY

Vintners Supply Company (VSC) offers the complete line of filtration equipment from Velo acciai® (Italy). Velo acciai® has over 20 years' experience in stainless steel manufacturing. Equipment includes sheet filters; lees press filters, pressure leaf fitlers, stacked disc module housings, and micron-filtration plants, stairs and catwalks in stainless steel meeting any specifications.

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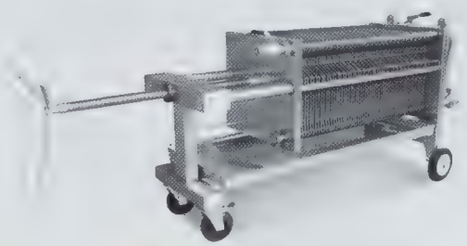

VSC offers a full line of filtration media and supplies, including cartridge filters, sheet fitlers, stacked disc modules, and filter aids. VSC is a leading supplier of replacement grape press membranes, made in Germany and available for most grape presses. Membranes are stocked at the VSC warehouse (Santa Rosa, CA) for immediate delivery.

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VSC offers a complete line of valves, fittings, tank mixers, and pumps from Inoxpa (Spain). Replacement parts and service are supported locally through Inoxpa USA (Santa Rosa, CA).

VSC will introduce on-line purchasing in 2009 at www.vintners supply.com for direct purchase of supplies over the Internet, and proposals for custom designed equipment.

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Demptos is proud to release ultra premium "Oak in Wine" oak alternatives in three products. Backed by Demptos' own research department, headed by Dr. Nicolas Vivas, Demptos produces its own oak powders, oak chips, and oak granulates. These enological tools are custom-roasted to order and shipped directly from Bordeaux, France to the cooperage and distribution hub in Napa, CA.

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Please contact a Demptos representative for more information and usage recommendations, or contact Demptos Napa Cooperage for product samples and available stock. Order early for Harvest demands.

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Mark Heinemann, Sales Manager / Enologist
cell: 707/738-0813
e-mail: mark@demptosusa.com
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PLEASE SEE DEMPTOS NAPA COOPERAGE AD, PAGE 36.

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Use virus-free plant material in new plantings for best fruit quality and yield.

Strategies to obtain virus-free vines

BY Mike Anderson,
Department of Viticulture & Enology,
University of California, Davis

Winegrape growers are greatly concerned about the spread of leafroll virus in Napa County vineyards. When polled in 2008, 98% of Napa growers reported concern about the spread of leafroll and 67% had seen leafroll already spreading into their vineyards. Many growers report that leafroll spread is significantly reducing the productive life of their vineyards.

When leafroll spreads into a healthy vineyard, the result is often reduced yield and fruit that colors and accumulates sugar poorly. These are serious economic concerns that can turn a valuable vineyard into a liability.

When a vineyard is removed due to virus spread, a grower's first resolution is to not repeat the performance. This means doing everything possible to plant a clean vineyard and keep it that way.

My opinion is that all new plantings need to be made with virus-free material; leafroll cannot spread if it is not there in the first place. The concern over leafroll has made obtaining the cleanest, most virus-free plant material imperative. Because leafroll can spread from one vineyard to another, planting virus-free vineyards is not only in the best interest of individual growers, but of the entire community.

How to obtain clean plant material

The path to clean plants can seem simplistic. It comes down to identifying clean plants to serve as a source, and then keeping them virus-free.

Careful observation should allow us to identify infected vines from healthy ones. Most viruses display symptoms. For example, leafroll causes leaves to turn red. We all know about going into a vineyard to collect budwood and making sure to only collect wood from vines **not** showing red leaves. However, although this seems simple and effective, in practice there are many potential flaws.

To begin with, in addition to virus, red leaves on red-fruited varieties are caused by a variety of disorders, and leaves of virus-infected white varieties do not turn red at all. Even an expert cannot consistently assess vine virus status simply by walking through a vineyard. Harvesting budwood from your own or your neighbor's vineyards simply does not provide the necessary safeguards required of an investment as great as planting a new vineyard.

The first stop for planting a clean vineyard is to buy vines certified by the California Grapevine Registration & Certification Program. Certified vines have a pedigree that traces back to Foundation Plant Services (FPS) at UC Davis. Plants originating from FPS have been subjected to the most thorough assessment of varietal identity and virus status available.

In recent years, many selections at FPS have undergone apical meristem culture to remove any viruses. This process is referred to as shoot tip culture by FPS. FPS believes selections that have undergone shoot tip culture are the cleanest of the clean plants. Whenever possible, buy plant material that traces to vines produced by this method.

Vines that pass FPS scrutiny are included in the FPS Foundation Vineyard and are made available to the public. Most commonly, this material enters into the California Grapevine Certification program, which works with participating nurseries to maintain both the cleanliness and varietal correctness of vines in the program. Certified blocks at the nurseries are known as increase blocks.

Certified grapevines are your best choice when purchasing grape planting material. The sources, and every propagative step taken to produce certified vines, have been regulated and documented. All this might lead you to believe that buying clean plants is as simple as buying certified. This, unfortunately, does not appear to always be the reality.

In 2008, a survey was sent to Napa County growers asking them about their experiences with grape nursery material. The results are only "coffee shop talk," but I think they are worth giving attention to. Approximately 60% of respondents said they thought they had purchased certified material that was virus-infected and 40% said they *knew* they had purchased virus-infected certified material. The good news is that 85% said certified plants were the best available and 98% said buying virus-free plants was important to them.

There are either misunderstandings about whether the vines were infected with virus or some certified plant material is indeed virus-infected. The reality probably includes a little of both. The California Department of Food and Agriculture (CDFA) routinely tests some vines in the certification program and they do occasionally find vines with viruses. (See "Revision of regulations governing grape certification," page 91.)

Vines that test positive are removed, but the lesson is that a small portion of vines in the certification program are indeed virus-infected. This does not change the fact that certified vines are your best first choice for clean plants. What it does mean is that you want to know more about the vines you buy than whether or not they are certified.

How can it be that certified plants are delivered with a virus?

First, we need to make it clear that buying certified vines does not guarantee that the vines are free of virus. Guaranteeing that a plant is virus-free is virtually impossible, because as the science advances, tests used to assay viruses become more sensitive, allowing detection of viruses that were not previously seen. Only known viruses can be tested for.

Every effort is made to ensure that plants leaving FPS are free from virus but the best they can say is that, using the detection methods available at the time, they are free of *known* virus. The risk of buying certified vines that are infected with a virus is low, but a few steps can even further reduce this risk.

From time to time, FPS discovers that a vine in the Foundation Vineyard is not as clean as they thought it was or that it has become infected with a virus. Following such a discovery, FPS alerts the public and CDFA, and every effort is made to remove vines (originating from infected foundation vines) from increase blocks.

The CDFA understands that virus can spread, and tests adjacent vines in the increase blocks. This is not a perfect system, as it would not be impossible for vines a number of rows away from the virus-infected vine to become infected also. The lesson here is that age is your enemy and youth is your friend.

As technology improves, so does the ability of FPS to detect virus, and therefore the more recent material released by FPS is likely to be the cleanest. Also, the newer an increase block is, the more likely it is that virus-infected vines have never been planted in the block.

Infection and errors at the nursery can occur. One of the most important steps a nursery can take to safeguard material they have is to be isolated from other vineyards. Proximity to grape growing districts invites unintentional infection from commercial vineyards.

CHECKLIST FOR PURCHASING VIRUS-FREE VINES:

Buy certified material. By accepting only certified material you make the single most important step toward planting your vineyard with virus-free vines.

Buy material from recently established increase blocks. Newer increase blocks have the most recent FPS material and are less likely to have been infected at the nursery.

Buy material that was not produced in a grape growing region. In California, it is nearly impossible to be completely isolated from grapevines, but the farther away the better.

Avoid brokered material. It is always best when the vines you buy were propagated from start to finish at the nursery you purchase them from.

Look for selections that underwent shoot tip culture at FPS. You can find this information and much more at the National Grape Registry website http://ngr.ucdavis.edu/. Click varieties, search for the variety of interest, and view clone lists. Each clone is listed and you can look for shoot tip culture next to treatments. You will not always find this treatment but when you do, these are the cleanest plants.

If secondary increase blocks are approved, AVOID buying vines produced from them. You will have to ask your nursery. Even if you do choose to buy plants from a secondary increase block, this is something you want to be aware of.

Establish a good relationship with your nursery. Find someone to trust. The future of your vineyard depends on it.

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Many nurseries grow both certified and non-certified vines. Certified vines in these nurseries can be compromised by virus spread from non-certified material and by handling errors. Neither of these threats is intentional, but they add to risk.

It is not uncommon for nurseries to trade or broker material. It is a basic tenet of plant certification that every time plant material passes from hand to hand it is potentially compromised. In many certification systems, the material loses status each time it changes hands.

For example, a plant may change from grade A to grade B as it goes from one nursery to another. The compromise can be either from confused identification or contamination. The mistake may or may not ever be detected but can have a serious effect on vineyard production and wine quality. Look for isolated nurseries selling only certified vines and insist on knowing where the material originated.

Revision of regulations governing grape certification

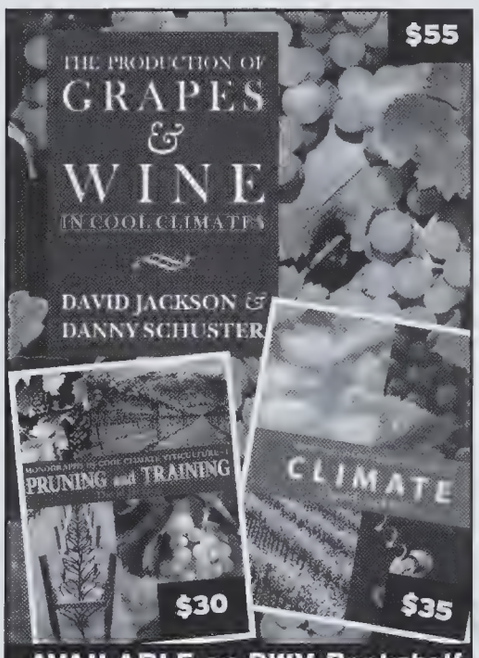
Regulations governing the grape certification program are currently being revised. New regulations call for increased monitoring of increase blocks, which is good. They also allow for secondary increase blocks, which are one step removed from primary increase blocks (thus far referred to simply as increase blocks), are often old, and more likely not to be clean.

According to the CDFA, in their Initial Statement of Reasons for the regulations, which you can find at the CDFA website http://www.cdfa.ca.gov/phpps/regs_grapevines.html:

Increase blocks planted prior to 1993 may be eligible for secondary increase block status if they are tested as described in subsection 3024.6 (b)(4) and the results are negative. There is a specific reason these older blocks will not qualify for primary increase block status under proposed regulations. ELISA technology was used for the first time in 1992 to check FPS foundation blocks for leafroll virus. About 20% of the mother vines in an old foundation block tested positive for leafroll. Distribution of leafroll virus in foundation blocks suggested that leafroll had spread into mother vines sometime after 1988. In 1993, R&C Program participants were required to remove all increase block vines propagated after 1988 from leafroll-positive source vines. However, problems with the leafroll virus in increase blocks continue so the proposed regulations will downgrade older blocks to secondary increase block status.

As the new regulations are currently written, nurseries will not be required to inform customers whether the certified vines they are buying came from primary or secondary increase blocks. If these regulations become effective, you should ask about the source of the vines you are buying, and steer away from secondary increase blocks.

As part of the process of evaluating and approving the regulations, a public hearing was conducted by the CDFA at UC Davis on March 17, 2009. The CDFA is now weighing the comments made at the hearing and approval is pending their review. ■



AVAILABLE on PWV Bookshelf

These books provides a backbround and guide to the production of grapes and wines, focusing on cooler regions. They describe, in a technical yet understandable way, everything from growing, to winemaking, to evaluating wine. A very nice, brief, affordable introduction to viticulture and enology practices in cool climates.

Prefermentation Maceration

Continued from page 65

placed on identifying various phenolic fractions in the grapes. ■

Author's note:

Products used in this study

The Merlot (Bordeaux, 2006) was inoculated with the *Zymaflore® RB2* yeast (20 g/hL, 200 ppm), rehydrated with *Dynastart®* yeast rehydration nutrient. For the Cabernet Sauvignon (Médoc, 2007), the yeast strain used in all cases was *Zymaflore FX10®*. In the Cabernet Sauvignon *"Grand Cru"* (2006), the tank "ENZ" received enzyme *Lafase HE Grand Cru®* and yeast *Zymaflore F15®*. The Merlot from the Entre-Deux-Mers (2006) received a yeast/enzyme combination of *Zymaflore RX60®/Lafase Fruit®*.

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Applebee's offers Ohio wines "in the neighborhood"

BY Don Neel

Applebee's Neighborhood Grill is a casual restaurant chain with 1,600 locations nationally, and a core wine list for its customers (one each White Zinfandel, Sauvignon Blanc, Pinot Grigio, and Merlot, two Cabernet Sauvignons, and two Chardonnays).

Greg Hatmaker, manager of the Applebee's in Elyria, Ohio, is a fan of local wines and wanted to add them to the wine list in Elyria. In 2008, Hatmaker approached Jim Arbaczewski of Ferrante Wine Farm (Geneva, OH) and Applebee's district manager Dennis Fisher with the idea, asking Arbaczewski if Applebee's staff could visit the area wineries and learn about Ohio wines.

Fisher agreed, and expanded the plan to include 15 Applebee's restaurants in northeast Ohio. In June 2008, Fisher and two area managers, Hatmaker and 14 other Applebee's restaurant managers boarded a trolley bus provided by the wineries and toured Ferrante Winery, Debonné Vineyards (Madison, OH), Grand River Cellars (Madison), and Firelands Winery (Sandusky, OH). The wineries provided food, guided tours, and activities to interest and educate the restaurateurs, sending wine samples home with the managers to select wines that Applebee's would offer diners.

Placing wines in restaurants

Wines chosen by Applebee's managers were: "Walleye White" table wine (Meier's Wine Cellars, Cincinnati), Lake Erie Pinot Grigio (Firelands), Reserve Riesling (Debonné), Chardonnay and "Austin's Red" blend (Grand River), and Golden Bunches Riesling (Ferrante). The choices provide a spectrum of varieties that Ohio produces well, and complement the core list, which has no Riesling, for example.

Since the wines are represented by three different distributors, and Ohio distribution and pricing regulations are complex, John Constantine of Vintage Wine Distributor became coordinator, working with fellow distributors to provide wines to the 15 restaurants.

Constantine worked with Applebee's and wineries' staff to design a table menu card featuring the Ohio wines, and Vintage printed 450 with the wineries contributing some of the expense. The card's information does not include vintage dates, to allow use for an indefinite length of time. Bottle price of the six Ohio wines ranges from $18.95 to $24.95. The cost of a five-ounce pour ranges from $6.00 to $6.95.

Program launch

The Ohio "Wines From the Neighborhood" program launched at 15 Applebee's locations in September 2008, with winery personnel visiting each restaurant to offer staff training and education, samples, T-shirts, and sales tools. Constantine followed up the launch by visiting some of the restaurants and walking around with samples he offered to diners.

"People love the idea of drinking local wines when I offer and explain them," Constantine says. "This program fits really well with the whole 'locavore' idea — the increasing desire of consumers to shop, eat, and drink

Each Applebee's restaurant has three wire flight caddies to serve three, two-ounce pours (cost range of $2.00 to $2.35). Photos by Harry Schwentker

Continued on page 98

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Spoilage microbe population fluctuations during winemaking — causes, effects, solutions

Previous columns in this space have discussed the wide variety of microorganisms that can exist in wine, even though, compared to most other beverages, the wine environment is relatively inhospitable to microbes. However, the various microorganisms that are able to survive in must, juice, and/or wine are not evenly distributed throughout the winemaking process, because particular groups or species of microbes tend to dominate at each stage of the process (such as harvest, fermentation, élevage, bottling).

The population fluctuations of spoilage microbes (from dominant to suppressed populations and even back to dominant) is a consequence of several factors, including the natural microbial flora of grapes, grape health, the sanitary state of harvest and winery equipment, the physical environment of must/juice/wine, the chemical environment of must/juice/wine, and even interactions among various microbes.

This column will discuss fluctuations in spoilage yeast and bacteria populations throughout the various stages of winemaking to include the factors responsible for population changes, the impact of increased populations on wine quality, and recommendations for minimizing population increases.

Raw material: Grapes and must/juice

Of the approximately 100 different yeast genera, currently only 12 are known to be associated with grapes, must/juice, or wine. These 12 yeast genera are split up into *Saccharomyces* yeast species, which complete fermentation of grape juice without the production of spoilage by-products (such as off-flavors, off-color, sediments), and non-*Saccharomyces* yeast species, which may or may not complete fermentation but often form spoilage by-products.

Saccharomyces has been detected on grapes and in grape must/juice, but it is generally found in very small amounts and not considered to be dominant at this stage. *Brettanomyces*, the most well-known and widespread spoilage yeast in the wine industry, has only rarely been identified on grapes or in must/juice and is thus not considered to play a dominant role at this stage.[1]

The other non-*Saccharomyces* yeast species tend to dominate at this stage; *Hanseniaspora/Kloeckera apiculata* is often the most frequently isolated species. Other yeast found on grapes or in grape must include *Candida, Crytococcus, Debaryomyces, Hansenula, Kluyveromyces, Metschnikowia, Pichia, Rhodotorula,* and *Torulaspora.*[1]

Zygosaccharomyces can also be found at this stage especially when concentrate or grape juice is added to red must or white juice. Among these yeast, *Hanseniaspora/Kloeckera apiculata, Candida, Pichia, Hanensula,* and *Zygosaccharomyces* are the most likely to cause spoilage of must/juice. As this stage, types of spoilage can include production of acetic acid, ethyl acetate, and acetaldehyde; and formation of films on the surface of must.

In addition to yeast, several species of bacteria can also be found on grapes and in must. Among the acetic acid bacteria, *Gluconobacter oxydans* is most prevalent on healthy, unspoiled grapes at concentrations generally around 10^2 cells/g. Grapes that are damaged, spoiled, and/or infected with the mold *Botrytis cinerea* have been shown to have high populations of acetic acid bacteria (10^6 cells/g). *Acetobacter aceti* and *Acetobacter pasteurianus* are the most dominant species.[2] High levels of acetic acid can be produced by these bacteria both on damaged grapes and in must.

On sound, undamaged grapes, viable lactic acid bacteria have been shown to exist at levels anywhere from 10^2 to 10^4 cells/g. Damaged or spoiled fruit can have significantly higher population levels. Species of lactic acid bacteria that have been detected on grapes or in must include *Lactobacillus casei, Lactobacillus hilgardii, Lactobacillus plantarum, Leuconostoc mesenteroides, Oenococcus oeni,* and *Pediococcus damnosus.*[3]

At this stage, there are several factors that can affect microbial population levels, such as the method of harvesting grapes (mechanical or hand), transport time and temperature, condition of grapes, and addition of preservatives (sulfur dioxide, lysozyme).

To effectively minimize spoilage yeast and bacteria populations at this stage, recommendations include periodically monitoring population levels on grapes and in must/juice; limiting damage and *Botrytis cinerea* infections of grapes coming into winery; keeping grapes cool during transport to slow microbial growth; maintaining pH levels at or below 3.7; adding sulfur dioxide (about 50 ppm) at the crush stage to reduce general microbe populations; and if lactic acid bacteria are detected as part of a monitoring process or winery has a history of their presence, add lysozyme (100 ppm to 200 ppm) to selectively discourage growth.

Alcoholic fermentation

During alcoholic fermentation, *Saccharomyces cerevisiae* invariably becomes the dominant yeast performing fermentation. This is the case whether the fermentation is initiated naturally or by inoculation with a commercial strain of *Saccharomyces*. However, during the early part of alcoholic fermentation and under either circumstance, several different non-*Saccharomyces* yeast species have the capacity to readily grow and reach peak population levels (10^6 to 10^8 cells/ml).[4]

The following non-*Saccharomyces* yeast species have been demonstrated to grow during the early stages of alcoholic fermentation: *Candida, Hanseniaspora/Kloeckera, Kluyveromyces, Metschnikowia, Pichia,* and *Torulaspora.*[1,5,6,7] *Brettanomyces* has been detected during alcoholic fermentation, but it does not dominate because it is a slow-growing yeast and does not compete well against other microbes for nutrients.

The ability of these non-*Saccharomyces* yeast species to persist during fermentation and potentially cause spoilage

depends on several factors including: ethanol concentration, fermentation temperature, strength of *Saccharomyces* inoculum, availability of nutrients, quantity and type of microbe flora present on incoming grapes, and sulfur dioxide content.

It is believed that the low ethanol tolerance of non-*Saccharomyces* yeast species compared to *Saccharomyces* is one of the primary reasons these yeast die-off during the early stages of fermentation.[1] Evidence also exists that conditions of reduced available oxygen play a significant role in the early death of these yeast species.[7] However, on the contrary, fermentations conducted at low temperature (10°C/50°F to 15°C/59°F) can extend survival time.[8]

Similar to the grape/must stage, unbridled growth of non-*Saccharomyces* yeast species during alcoholic fermentation (particularly the initial part) can lead to production of spoilage products such as acetic acid, ethyl acetate, and acetaldehyde; and sluggish or even stuck fermentations.

Once alcoholic fermentation is initiated, populations of acetic acid bacteria quickly decline. Acetic acid bacteria are aerobic microbes and thus require oxygen to grow. Alcoholic fermentation is not conducive to the presence of oxygen due to the vigorous production of carbon dioxide.

Viable populations of *Acetobacter* spp. can still be detected during fermentation, albeit at significantly reduced levels (less than 100 cells/ml), but *Gluconobacter* cannot survive.[1] If an alcoholic fermentation becomes sluggish or stuck causing carbon dioxide production to be reduced, then oxygen can become more prominent, thus permitting growth of acetic acid bacteria and potentially an increase in acetic acid content.

During typical alcoholic fermentation, *Saccharomyces* strongly out-competes lactic acid bacteria (*Lactobacillus*, *Pediococcus*, and *Oenococcus*). Thus, the bacteria will progressively die-off and not be a factor affecting fermentation. Because they produce ethanol and/or saturated fatty acids (decanoic and dodecanoic) yeast are believed to inhibit lactic acid bacteria.

The inhibition can also depend on the *Saccharomyces* strain.[9] Among the lactic acid bacteria, *Oenococcus oeni* is probably the best equipped to survive a typical fermentation since it can withstand higher ethanol concentrations and pH levels below 3.5.

While lactic acid bacteria growth is normally inhibited, there are several factors and/or conditions that can allow certain lactic acid bacteria species to survive and even thrive, causing sluggish or stuck alcoholic fermentation and initiation of malolactic fermentation:

1) sulfur dioxide is used at low concentration or not at all in the grape must;
2) the pH of must is so high (above 3.8) that the molecular sulfur dioxide level is low and thus lacks effectiveness;
3) high initial bacterial density; and
4) the hydrolytic activity of *Oenococcus oeni* on yeast cell walls.[9]

It is during instances of sluggish or stuck fermentation that lactic acid bacteria can cause dramatic increases in volatile acidity levels.

To limit spoilage microbe risk during alcoholic fermentation, implement periodic monitoring of fermentations to look for potential spoilage microbes; consistently use an optimum yeast inoculation rate (2 pounds/1,000 gallons); control fermentation temperature so it does not get too cold (under 50°F/10°C for white wine and under 65°F/18°C for red wine) or too hot (above 65°F/18°C for white and above 86°F/30°C for red); and properly manage nutritional content (such as assimilable nitrogen) to produce a smooth, consistent alcoholic fermentation and ensure a "nitrogen desert" following malolactic fermentation.

Malolactic Fermentation

By the time alcoholic fermentation has proceeded to dryness (less than 0.20 g per 100 ml residual fermentable sugar), the *Saccharomyces* population will have dropped off significantly. However, during malolactic fermentation, *Saccharomyces* will remain viable along with some other yeast species that either survived during alcoholic fermentation or were picked up as contaminants: *Brettanomyces*, *Zygosaccharomyces*, *Pichia*, and/or *Candida*.

At this stage, *Saccharomyces* is not a threat to wine quality; however, *Brettanomyces* (4-ethyl phenol, 4-ethyl guaiacol, acetic acid), *Zygosaccharomyces* (sediment, turbidity), and *Candida*/*Pichia* (acetic acid, ethyl acetate, surface film) can cause spoilage especially if malolactic fermentation continues for an extended period (several months).

During malolactic fermentation, acetic acid bacteria populations tend to remain low; however, their levels can increase if sufficient aeration and agitation are generated (during transfer of wine from fermentation tank to storage tank, racking, etc.), leading to increases in acetic acid levels.[2] In addition, carbon dioxide production is much less vigorous during malolactic fermentation thus increasing the probability of oxygen incursion.

Under most circumstances following alcoholic fermentation, the predominant bacterial species is *Oenococcus oeni*. Whether spontaneously or by direct inoculation via a commercial strain, *Oenococcus oeni* is the bacteria most often responsible for malolactic fermentation, in which it converts malic acid to lactic acid. Significant conversion of malic acid is generally initiated when *Oenococcus oeni* reaches a population of 10^6 cells/ml. At the peak of conversion, the population can reach 10^8 cells/ml.[10]

Lactobacillus and *Pediococcus* can also perform this conversion, so there are frequent instances during which they also actively participate in the process. The presence of these lactic acid bacteria is undesirable because of their propensity to form wine spoilage products (such as acetic acid, diacetyl, acrolein, biogenic amines).

During malolactic fermentation, spoilage microbe risk can be minimized by monitoring wines for spoilage microbes; monitoring wines for volatile acidity spikes; directly inoculating with selected *Oenococcus oeni* strains; eliminating tank-to-tank spreading of malolactic bacteria; minimizing incursion of oxygen into the process; maintaining pH at or below 3.7; and racking wine and adding an appropriate level of sulfur dioxide immediately following completion of malolactic fermentation.

Post fermentation/élevage

Following malolactic fermentation, several different yeast and bacteria species can grow and will spoil wine if the

proper enological practices are not implemented during élevage. Among the yeast species, *Brettanomyces*, *Candida*, *Pichia*, and *Zygosaccharomyces* can cause the most significant spoilage. *Candida*, *Pichia*, and *Zygosaccharomyces* can grow rapidly, while *Brettanomyces* tends to grow very slowly (taking anywhere from five to seven months following vinification to achieve a maximum population density).[11] The spoilage potential of these yeast species was discussed above in the malolactic fermentation section.

Populations of *Acetobacter* spp. can significantly increase during élevage when winemaking practices encourage the incursion of oxygen into wine (as a result of wine transfer or racking, lack of humidity in barrel cellar, not maintaining headspace, etc.). *Acetobacter* levels can quickly reach 10^2 to 10^5 cells/ml or even higher, leading to increased volatile acidity in stored wines.[2]

Even in wines stored relatively anaerobically, *Acetobacter pasteurianus* has been shown to survive for extended periods of time.[12] Under anaerobic conditions, at least part of the *Acetobacter* spp. population is likely existing in a viable but non-culturable (VBNC) state (the VBNC phenomenon was discussed in detail in the March/April 2009 ***PWV***).[13]

After malolactic fermentation, lactic acid bacteria (primarily *Lactobacillus* and *Pediococcus* spp.) are also very undesirable in wine due to the myriad of spoilage products they can produce (such as excessive acetic acid production, haziness, carbon dioxide production, diacetyl, biogenic amines, etc.). If these bacteria are not properly managed as discussed below, they can continue to metabolize several different available wine components, including glucose, malic acid, fructose, arabinose, trehalose, amino acids, and citric acid.[1,9]

During élevage, there are several critical enological practices that must be performed to minimize and even prevent increases of spoilage microbe populations:
1) Routinely monitor wines for spoilage microbes;
2) Rack wines from heavy lees as soon as possible following fermentation;
3) Filter wines if microbes are known to be present in wine or if the winery has a history of a spoilage microbe(s);
4) Maintain high levels of humidity (about 80%) to prevent barrels from drying out;
5) Maintain full tanks and barrels to minimize wine contact with air;
6) Maintain an empty barrel management program by keeping barrels filled with sulfur dioxide gas, a solution of sulfur dioxide/citric acid, or wine;
7) Maintain oxygen levels below 1.0 mg/L in cellared wines;
8) Maintain an ideal temperature for wines in tanks and in barrels (less than 60°F/16°C);
9) Maintain pH levels at or below 3.7; and
10) If possible, maintain molecular sulfur dioxide levels above 0.5 ppm.

Bottling

The final stage of the winemaking process, bottling, is the **least desirable** time to observe microbial populations. Therefore, it is critical to have a microbiologically stable wine prior to bottling to prevent post-bottling microbiological activity (secondary fermentation). Microbiologically stable wines can be achieved by using preservatives/sterilants (sulfur dioxide or Velcorin™) and/or filtration just prior to and during the bottling process.

There are essentially four major scenarios that permit microbial contamination of bottled wine:
1) Bottling unfiltered wine that is not microbiologically stable,
2) If the membrane filter on the bottling line fails while a microbiologically unstable wine is being bottled,
3) If the dosage level of Velcorin™ is inconsistent during bottling,
4) When contamination is caused by an unsanitary bottling line.

A number of yeast and bacteria species can survive and even grow in the bottle when nutrient conditions are appropriate. Yeast that have been detected in finished wines include *Saccharomyces*, *Zygosaccharomyces*, *Brettanomyces*, *Saccharomycodes*, *Schizosaccharomyces*, and *Pichia*.[14,15] Among these, only *Pichia* has little to no spoilage potential in bottled wine, because it is an aerobic organism.

Saccharomycodes has only rarely been detected in cellared or bottled wines.[16] *Brettanomyces* appears to have the best survival skills in a bottled environment, due to its minimal requirement for nutrients and its ability to use ethanol as a carbon source. It can survive for months and even years in bottle.[14]

For all of the above mentioned yeast species, except for *Pichia*, the primary spoilage threat for bottled wine is secondary fermentation in which carbon dioxide is generated. Other spoilage activities include production of off-flavors, off-color, and sediment formation.

The anaerobic environment found in bottled wines normally prevents growth of *Acetobacter* spp.; however, there is evidence that it can survive under anaerobic conditions in a VBNC state.[17] Under these circumstances, acetic acid bacteria could then cause spoilage of wine once the bottle is opened and the wine is exposed to oxygen.

Because lactic acid bacteria are considered to be microaerophilic, they don't require very much oxygen for growth. This allows them to survive and even grow in bottle if the necessary nutrient conditions are met (such as the presence of sugars, malic acid, citric acid, etc.). Among the lactic acid bacteria, *Lactobacillus*, *Oenococcus*, and *Pediococcus* have been shown to grow in bottled wines.[1,14] The primary spoilage activity they produce in bottle is secondary fermentation from carbon dioxide generation.

Since bottling is the last line of defense for a winery to prevent microbial contamination, it is recommended that this stage have a robust microbial defense strategy in place (this strategy was discussed in detail in the January/February 2009 ***PWV***).[18]

A microbial defense strategy should be a two pronged approach:
1) treatment of microbiologically unstable wines with preservatives/sterilants (sulfur dioxide, Velcorin™) and/or filtration; and

2) a bottling QA/QC program.

An effective program needs to include routine sanitation, regular monitoring of finished product for microbes, a set of specifications for allowable microbial levels for sanitation and in bottled wine, and routine monitoring and maintenance of bottling line equipment.

Conclusion

Many factors can influence populations of spoilage microbes during the winemaking process. Some of these factors cannot be easily controlled by the winery staff (such as natural grape flora), while others have a greater potential for control (such as grape quality, pH, sulfur dioxide content, sanitation).

By understanding the factors responsible for spoilage microbe population fluctuations, how spoilage microbe increases can negatively impact wine quality, and what is required to minimize their populations, wineries have the tools to effectively manage and even prevent wine spoilage microbes from building up during the winemaking process. ■

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Ohio wines at Applebee's

Continued from page 92

locally, and with Applebee's 'in your neighborhood' national branding."

Tony Debevc (Debonné Vineyards) says, "Applebee's staff participation is a key factor in the program's success. Our wines weren't just placed on their lists; Applebee's took on our wines, and then made sure they are introduced to customers by informed servers."

Program success

"Fourth quarter 2008 data showed an increase in overall wine sales," reports Fisher. "We were concerned that we would trade sales dollars and would not see incremental sales. The results showed we might have traded a few dollars with liquor, but any change was made up in the amount of dollars that were traded up from non-alcoholic beverages.

"Our overall liquor mix for the 15 Ohio wine stores increased while the rest of our market was flat. There was very little trade-off from the core wine list to Ohio wines. The core wine list sales mix averaged 9% each quarter in 2008. The 15 stores with core and Ohio wine lists averaged 12% in the third and fourth quarters, a 3% increase."

"We want to expand the Ohio 'wines from the Neighborhood' program from 15 to more Applebee's restaurants to include more Ohio wineries in northeast Ohio this year," concludes Fisher.

Constantine reports sales of 200 cases of Ohio wines in six months by Applebee's 15 restaurants.

Ohio wines are performing well in the program, selling in addition to the core wine list rather than cannibalizing list sales, which was a concern before the program launched. Winery visitors are mentioning they saw or tasted Ohio wines at Applebee's.

"The most important thing in the development and implementation of the program," Constantine, Arbaczewski, and Debevc agree, "was the cooperation between wineries, distributors, and restaurants to place the wines, train staff, and promote the program."

"Working together, we got our wines placed in 15 Ohio locations of a nationally-known chain of restaurants," concludes Debevc. "That's huge for Ohio wines. We proved that if neighboring wineries and distributors can work together with this sort of regional cooperation, the increased exposure for the wines can be invaluable." ■

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The Boswell Company	29, 68	415-457-3955	415-457-0304	boswellcompany.com
Breckenridge Winery Software	30	303-267-0024		breckenridgesoftware.com
Canton Cooperage	31	707-836-9742	707-836-9759	xtraoak.com
Castoro Bottling Company	45	805-467-2002	805-467-2004	niels@castorobottling.com
Cedar Ridge Vineyards	12	519-676-5512	519-676-5160	
CoBank	8	707-545-1200	707-545-9400	tlindley@agloan.com
Cork Quality Council	58			corkqc.com
Corktec	58	860-851-9417	860-749-3478	corktec.com
Criveller Company	52	905-357-2930	905-374-2930	criveller.com
D&S Ag Designs	56	866-594-9943	559-651-2161	dandsagdesigns.com
Demptos Napa Cooperage	36	707-257-2628	707-257-1622	demptosusa.com
DSM Food Specialties	63	973-257-8372	973-257-8265	dsm-oenology.com
Duarte Nursery	20	209-531-0351	209-531-0352	duartenursery.com
Encore!	51	707-745-4444	707-748-4444	encoreglass.com
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Gamajet Cleaning Systems	32	877-426-2538	610-408-9945	gamajet.com
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Hill & Associates	74	707-258-2000		bestwinejobs.com
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JWB Marketing/ Bird Gard	21, 37	800-555-9634	803-796-0654	birddamage.com
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GW Kent	33	800-333-4288	734-572-1300	gwkent.com
Kimco Mfg.	60	800-356-9641	559-277-9358	kimcomfg.com
KLR Machines	14	707-823-2883	707-823-6954	klrmachines.com
Knox Industries	49	415-751-6306	415-221-5873	icilabas@pacbell.net
Koch Membrane Systems	99	888-677-5624	978-694-7020	kochmembrane.com/wine5
Stephen Koster Consulting	61	707-433-7029		stevekoster@hughes.net
Laffort USA	7, 9	707-815-0225		russell.robbins@laffort.com
Lake County Grapevine Nursery	22	707-968-9674		lcgn.net
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Napa Fermentation Supplies	64	707-255-6372	707-255-6462	wineyes@aol.com
New Viticulture	41	831-626-3035		newviticulture.com
Oak Solutions Group	43	707-259-4988	707-259-5952	pabbott@oaksolutionsgroup.com
Ogletree's	65	707-963-3537	707-963-8217	speers@ogletreecorp.com
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P&L Specialties	57	888-313-7947	707-573-3140	pnlspecialties.com
Pacific Gas & Electric	5	800-468-4743		pge.com/agfood
Pickering Winery Supply	65	415-474-1588	415-474-1617	pickering@sbcglobal.net
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St. Patrick's of Texas	20	512-989-9727	512-989-8982	stpats@bga.com
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Seminar Group Beer&Wine Law	55	800-574-4852		seminargroup.net
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Sonoma Cnty Winegrape Comm.	75	707-522-5860		sonomawinegrape.org/marketplace
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Sterling Insectary	69	661-792-6810	661-792-6880	sterlingnursery.com
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Tonnellerie Sirugue	77	310-452-8147	310-452-7847	siruguesa@earthlink.net
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Vineyard Industry Products	22	800-544-2210	707-431-0807	vineyardindustryproducts.com
Vinotec Group	56, 62	707-953-7072	707-224-4028	badwinelady@aol.com
Vinquiry	64	707-838-6321	707-838-1765	info@vinquiry.com
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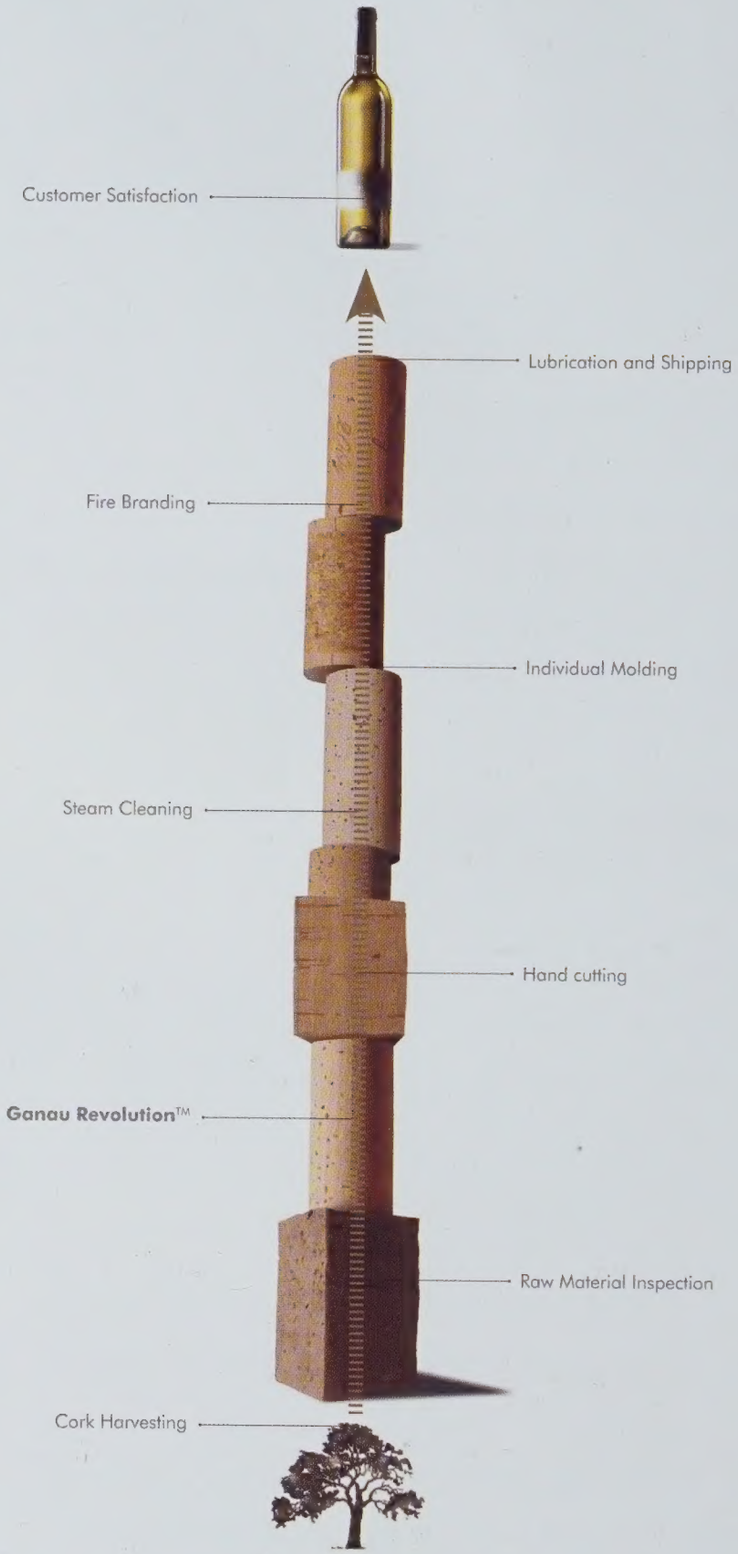

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